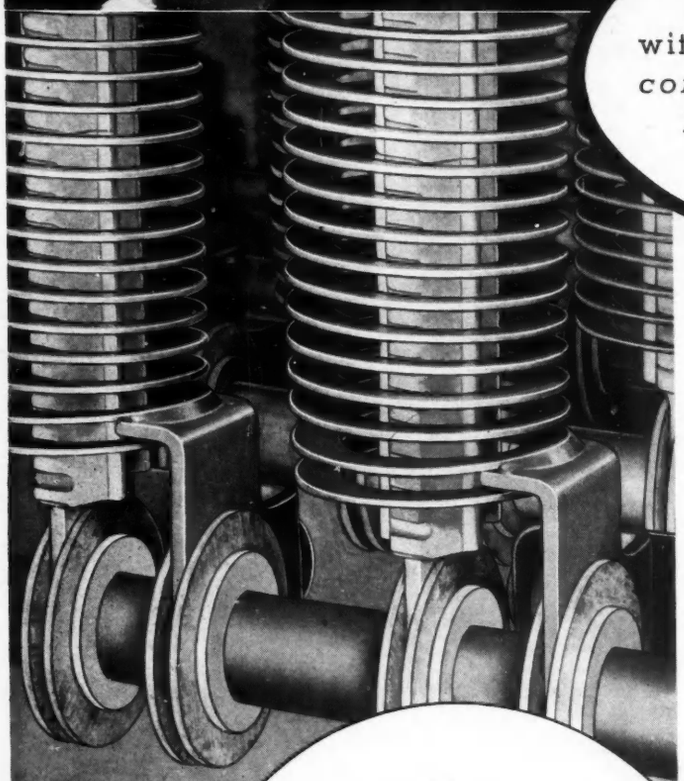
AUTOMOTIVE INDUSTRIES

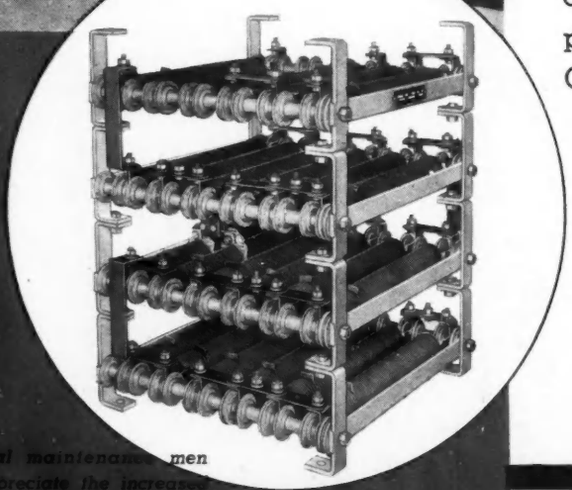
LAND — AIR — WATER

JUNE 12, 1937

They can TAKE IT and LIKE IT!

Clark "3C"
Edgewound Resistors
with welded terminals *provide constant, positive contacts. Expansion, contraction, vibration... can't knock 'em loose!*





Electrical maintenance men will appreciate the increased space which has been provided in the Clark "3C" Edgewound Resistor shown above.

● The resistor material is cold wound *on edge,* thereby withstanding shocks and vibration. A cage form of resistor material protects porcelain insulators. • Corrosion-resisting! Mill resistance material is ADVANCE copper nickel alloy. All other parts are cadmium-plated. • Wider spacing between units provides easier accessibility and greater heat-dispelling areas. • Note the all-around, sturdy, light-weight, compact construction which enables Clark "3C" Edgewound Resistors to

"TAKE IT AND LIKE IT"

★ ★ ★

BALTIMORE • BIRMINGHAM • BOSTON • BUFFALO
CHICAGO • CHATTANOOGA • CINCINNATI
CLEVELAND • DALLAS • DENVER • DETROIT
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THE CLARK CONTROLLER COMPANY

1146 EAST 152nd STREET CLEVELAND, OHIO

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Reg. U. S. Pat. Off.
Published Weekly

Volume 76 Number 24

Contents

C. A. MUSSELMAN, Pres.; J. S. HILDRETH, Vice-Pres. and Manager, Automotive Division; G. C. BUZBY, Vice-Pres.

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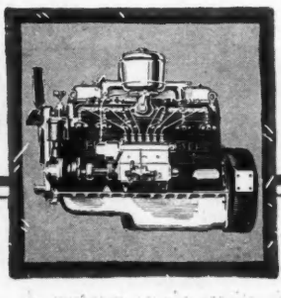
British Columbia Motor Transportation, Ltd., operates comfortable, fast Hayes buses out of Vancouver to Seattle and to points in British Columbia's rugged Cascade Range. Equipped with Hercules Engines, these modern, safe and comfortable vehicles cruise fully loaded at sixty miles an hour on the valley run to Seattle. Ten new buses—powered by Hercules like their predecessors—have just been ordered. Bus manufacturers throughout the world use Hercules Engines—either gasoline or Diesel. They, like the leading manufacturers of trucks, tractors and heavy-duty industrial, agricultural and oil-field machinery, have found Hercules Engines efficient and dependable, the Hercules organization unusually well equipped to aid manufacturers.

HERCULES MOTORS CORPORATION, CANTON, OHIO

America's Foremost Engine Manufacturer • Power Plants from 4 to 200 H. P.

HERCULES ENGINES



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AUTOMOTIVE INDUSTRIES

June 12, 1937
Vol. 76, No. 24

UAW to Broadcast for Year

A principal feature of the United Automobile Workers' drive against the Ford Motor Co. will be daily broadcasts from radio station WJBK, Detroit. The union has signed a one-year contract with the station calling for one 15-minute broadcast from 7 to 7:15 p.m. each week day and a 30-minute broadcast beginning at 9:30 a.m. each Sunday. In addition, the station will announce 12 times a day: "This is station WJBK, the Voice of Labor."

Apparently the union feels that its battle for Ford recognition and for the closed shop generally will be a long one, to judge from the length of the broadcasting contract signed.

Station WJBK is not affiliated with National, Columbia or Mutual Broadcasting systems.

Production Troubles Cut Sales

Loss of Single Day's Output Reduces Retail Purchasing; Truck Volume Begins Moderate Seasonal Drop

Production continues to be the limiting factor on retail sales of motor vehicles. So closely is the rate of deliveries tied to that of production that the loss of a single day's output is promptly reflected in the retail sales volume. This was clearly evidenced in last week's delivery figures which registered the industry's shutdown for Memorial Day. In most instances, where field stocks were limited, the week's sales volume showed marked recessions. Similarly, the final ten days of May failed to show the usual end-of-the-month bulge in deliveries of companies receiving ten-day reports, since that period had only six production days compared with eight in the preceding ten-day period.

Inability to supply the requirements of the market held the May retail volume down to about that of April whereas unfilled orders and the brisk demand enjoyed by dealers had indicated a seasonal peak for May which would have been considerably higher than the preceding month's total. Now, on the basis of deliveries made by leading companies, it is estimated that May retail sales approximated 469,000 cars and trucks which is exactly the number of units delivered in April and compares with 456,000 units in May last year.

Division of last month's business between cars and trucks, however, differs considerably from that of April. Passenger cars made a good gain but trucks, which for several months have been selling in record volume, began to ease off. May deliveries of passenger cars are estimated at 403,000 units against 387,000 in April and against 394,000 in May last year. Truck deliveries dropped to an estimated 66,000 from 72,000 in April, compared with 62,000 in May, 1936.

Unless labor troubles interfere with production to the extent that the factories miss their June schedules by a considerable margin, retail sales this month probably will carry on at the May rate or close to it. Some sales officials are beginning to sense a slackening in demand which is entirely in line with the advanced season, but they admit there is little evidence to support this feeling. There is still a substantial accumulation of unfilled orders on hand with dealers pressing for more

(Turn to page 868, please)

Strike Wave Cripples Operations

Authorized and Unauthorized Stoppages Hamper Many Branches of Industry; Some Disputes Are Settled

Another wave of authorized and unauthorized walkouts and sitdown strikes broke into production schedules in automotive centers this week at a score of plants. For the time being at least, the interruptions can hardly be classified as unexpected, since they are occurring with great frequency and come in many lines of business.

Among the most serious was another power plant strike at the works of the Consumers Power Co. in the Saginaw Valley, Mich. Apart from the stoppage of work at General Motors and other automotive plants in the Bay City, Saginaw and Flint, the strike crippled cities and communities and left them without fire and police alarms or hospital service. It was ended by the intervention of Governor Frank Murphy who warned UAW officials that the State of Michigan would protect the interests of the public unless power was promptly restored. The strike was said to be unauthorized and took place when powerhouse workers rejected a wage and hour agreement signed in Washington on June 7. Union officials flew to the scene to persuade the men to return to work.

Fifteen hundred employees of the Budd Wheel Co. walked out in Detroit on Wednesday morning in protest over failure of negotiations on pay arrangements. This forced the closing of the Dodge Bros. truck plant for lack of ma-

(Turn to page 865, please)

This Week

NEWS covers late sales and shipments reports... Labor front developments affecting the automotive industry . . . The tale of the hopped-up races at Muroc Dry Lake where 140 hybrid cars set high speed marks . . . Details of International Harvester's big new truck engine plant . . . Summer production plans of the industry.

FEATURES include production details on the Ford 60 hp. engine . . . A report on die casting technique at the Alemite plant . . . A foreign viewpoint on injection pumps for diesel engines.

IHC To Build Truck Engine Plant

Will Concentrate That Division at Indianapolis; Plans Two Assembly Lines to Make 700 Units Daily

International Harvester Co. will soon begin the construction of a $4,000,000 motor truck engine plant at Indianapolis where engines for its entire line of trucks will be built, it was announced by Sydney G. McAllister, president. The plant will rise on a 75-acre tract in the southeastern part of the city and production of engines is expected to start in it by Feb. 1, 1938. It will have an initial capacity of 700 engines a day and will employ 3000 men.

Space freed at the Fort Wayne, Ind., and Rock Island, Ill., factories by the transfer of truck engine operations to Indianapolis will be used for tractor engine production and the manufacture of axle and transmission assemblies. No reduction of operations at either point is expected. The company does not expect to shift employes from one city to another in the rearrangement.

Mr. McAllister said the construction of the new plant is the largest single step in factory expansion undertaken by the company in a number of years. Growing demand for the company's trucks was the reason for the addition, he stated. The program has been under discussion for several months. Truck engines built at the new plant will be shipped to the truck plants at Fort Wayne and Springfield, Ohio.

The Indianapolis plant will consist of a large main building for engine manufacture, a modern foundry, and a heating plant with electric power sub-station. Both the main manufacturing building and the foundry will be one story in height.. The manufacturing building will have 340,000 sq. ft. of floor space, and the foundry will have 260,000 sq. ft. The manufacturing building will be of the so-called saw-tooth design, while the foundry building will have an M-shaped roof line.

Both principal buildings will be of steel frame construction, with sidewalls of brick and glass. Roofs will be of gypsum with composition covering.

The main manufacturing building will have two progressive assembly lines for the manufacture of engines, each 500 feet long. Modern overhead conveyor systems will be used in the movement of engine parts through the factory.

The foundry will be mechanically equipped, and will have a daily capacity of about 300 tons of gray iron castings.

Registration of International trucks in the United States increased five-fold in the ten years between 1926 and 1936. In 1926, new registrations of International trucks of all sizes and models in the United States totaled 14,086. In 1936 the number was 71,958.

In addition to the new truck engine plant, the Harvester company is now building a new branch house in Indianapolis for the distribution of its truck and farm implement lines. The truck division of the new branch will be opened about July 1.

May Shipments 535,000 Units

Ford Estimate Again Included; Industry's Total Dips 3 Per Cent From April But Is 11 Per Cent Over 1936 Month

With an estimate of Ford Motor Co. shipments included and scheduled to continue as part of the compilation, May automobile and truck factory shipments, reported by the Automobile Manufacturers Association, are placed at 535,000 units. This is a decline of 3 per cent from the April total of 553,415, but an increase of 11 per cent or about 55,000 over the 480,518 units shipped in the month of May, 1936.

On the basis of this estimate for May, factory shipments for the first five months of the year were 2,390,924 cars and trucks, a gain of 12 per cent over the 2,125,140 units shipped in the corresponding period of 1936.

Every major manufacturer in the United States and Canada is now included in the figures which indicate quite clearly the movement of cars and trucks from factory to dealer.

During part of the life of the NRA, beginning Nov. 7, 1933, the Ford Motor Co. co-operated with the then National Automobile Chamber of Commerce which became the Automobile Manufacturers Association in the summer of 1934, and supplied its figures for inclusion in the industry's totals. Subsequently, however, the Ford figures again disappeared from the monthly estimates, and have been included only irregularly since then.

Record Unit Sales Made

Record retail sales of passenger cars and trucks were made in the first four months of this year, according to Alfred Reeves, general manager of the Automobile Manufacturers' Association. The volume of 1,502,963 units, compared with the previous record of 1,480,031 units sold in the first four months of 1929, and with 1,322,952 units sold in the like portion of 1936.

April retail sales volume was 459,780 units, against 482,135 in March and against 457,314 in April, 1936.

Factory shipments of trucks from plants located in the United States and Canada also set new records this year for both the month of April with 100,508 units, and for four months with 344,128 units.

Passenger Car Production by Wholesale Price Classes

(U. S. and Canada)

Four Months 1937 and 1936 Compared

	1937	1936	Per Cent Change	Per Cent of Total 1937	Per Cent of Total 1936
$500 and under	763,410	741,038	+ 3.0	50.50	55.38
$501-$750	681,498	523,163	+30.3	45.08	39.10
$751-$1000	48,208	52,366	− 8.0	3.19	3.91
$1001-$1500	12,362	16,004	−23.7	.82	1.20
$1501-$2000	4,843	3,515	+37.8	.32	.26
$2001-$3000	1,382	1,811	−23.8	.09	.14
$3001 and over	93	156	−40.4	.00	.01
Total	1,511,796	1,338,053	+13.0	100.00	100.00

Truck Production by Capacities

(U. S. and Canada)

Four Months 1937 and 1936 Compared

	1937	1936	Per Cent Change	Per Cent of Total 1937	Per Cent of Total 1936
1½ Tons and less	325,884	289,882	+12.3	94.70	94.56
2 to 3 Tons	12,255	12,004	+ 2.0	3.56	3.91
3½ Tons and over	3,779	2,575	+47.0	1.10	.84
Special and Buses	2,200	2,108	+ 4.9	.64	.69
Total	344,128	306,569	+12.2	100.00	100.00

Muroc Mechanical Cocktail Party

California Youngsters Who Hate to Leave Standard Heads on Cars Show High Speeds in Their Own Contraptions

When exuberant members of the younger generation decide to try out their latest "hopped up" jobs, the galleries usually consist of a few irate motorists and as many policemen as happen to be in the vicinity. But over 10,000 people drove 125 miles from Los Angeles to spend six hours in blazing sunlight and alkali dust watching "mechanical cocktails" from all parts of the state show their speed.

The tests consisted of driving a clocked 1/5 mile on one of the world's best straightaway courses, Muroc Dry Lake. There were over 140 home construction jobs in the competition, and when the dust cleared and times were checked, speeds up to 118 miles an hour were recorded. The crowd of spectators, which included five hundred United States Army men, was the largest ever to see this annual event.

Under the joint auspices of the Muroc Timing Association and the Knight Riders, these races and time trials have been held annually for the last nine years, with the single exception of 1936. The Knight Riders, whose home tinkering ground is Fullerton, Cal., is an organization which was formed several years ago by young auto enthusiasts who hate to leave a standard head on a car.

The aim of the Muroc Timing Association is simply stated by George Wight, originator of the plan:

"We find that the speed trials offered by our organization have a double advantage. First, they provide an opportunity for accurate checking of the efficiency of motor accessories, both home built and commercial. We have found that no small advancement in design has been achieved through the test conditions provided by these races.

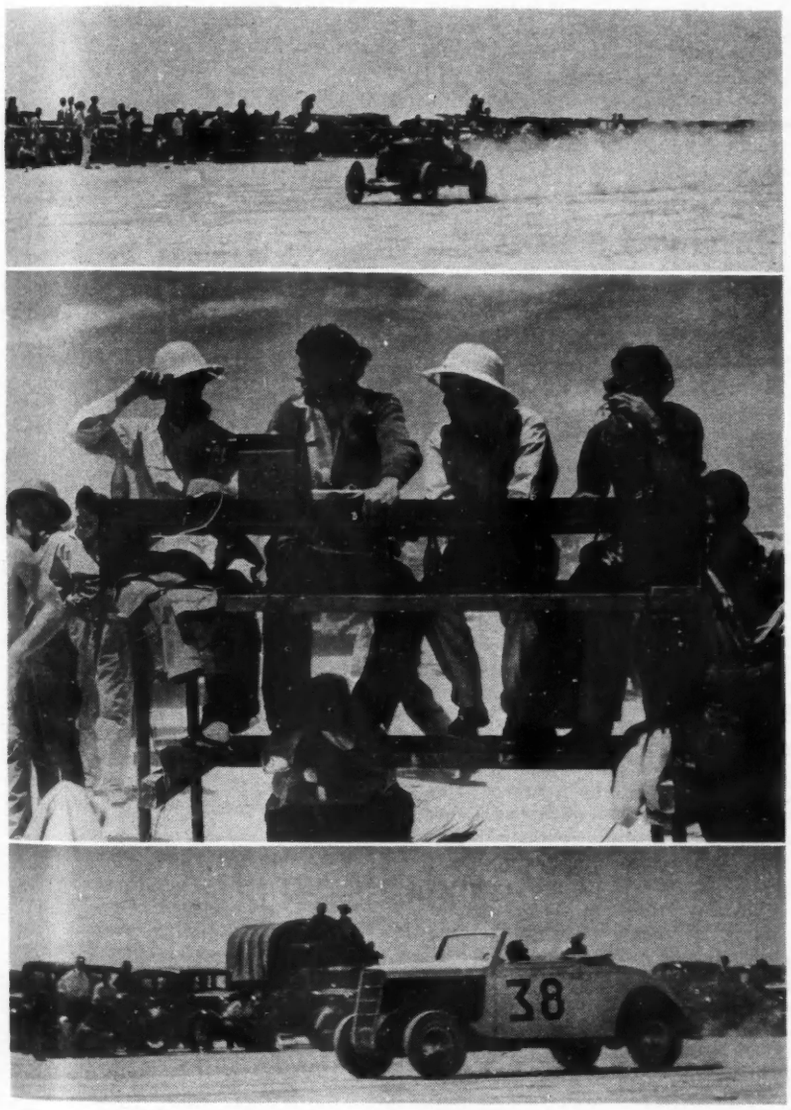
"We have also found that these races, high speed as they are, actually tend to increase safety. You can hardly blame a fellow wanting to try out his car after having spent many hours and much money increasing its efficiency. Muroc Dry Lake provides a safe method of doing this. Of course, we have no way of checking, but we believe that a large amount of high-speed driving on dangerous city streets has been prevented by the safety valve offered by these races."

There has never been an accident in the races themselves.

To give every contestant a chance to win a prize, cars are divided into several classes, depending upon the maximum speed and the type of body.

The best time of this year's event was 118.42 miles per hour, made by Duke Hallock driving a Model B Ford with a Cragar head. In many respects, however, the record was eclipsed by Bobby Nordskog of Los Angeles, whose "mechanical cocktail," compounded of an ancient Model T Ford block and chassis, Rajo head, and home built racing body, achieved the phenomenal speed of 103.45 m.p.h. His car was the best appearing modified body in the race.

Another combination of parts was in the Class H winner driven by Ralph Schenck. The engine had a Model B Ford crankshaft, 3⅞ in. bore, Oldsmobile head, Chevrolet block and Model B Ford connecting rods. The driver took two years to build the car. He had never driven over 90 m.p.h. before but won in his class with 111.11 m.p.h.



HOPPED-UP racing cars produced and driven at Muroc Dry Lake, Cal. by car-crazy youngsters of that state. At the top is a car in the 90-100 m.p.h. modified body class entering the 1/5 mile clocking stretch with some of the 10,000 spectators lining the track. In the center are four of the officials of the Muroc Dry Lake Timing Association at the judges' stand for the races. The lower picture shows a specially-equipped Ford in the stock body class passing the judges' stand at 92.78 m.p.h. The races were held in a temperature of 120 deg.

Grigsby Forms New Company

Elsbert Manufacturing Co., Inc., has been formed to produce ignition devices and systems for internal combustion engines, particulary those using low grade fuels, and a new type of slow speed, high torque electric motor of fractional horsepower suitable for windshield wiper operation. President of the company is B. J. Grigsby, who organized and headed the former Grigsby-Grunow Co. R. J. Grigsby is vice-president, O. E. Grigsby is secretary and H. E. Kranz is chief engineer. The company will have headquarters in Chicago.

Books

of automotive interest

"Compensating Industrial Effort." A scientific Study of Work and Wages. By Z. Clark Dickinson, professor of economics, University of Michigan. New York, Ronald Press Co., $4.50.

The three general divisions of this approach to the wage problem include "Human Nature in Work," "Wage Elements, Influences and Administration," and "Wages and Other Incentives."

"Organization and Management in Industry and Business." By William B. Cornell, M.E., professor of management in New York University's School of Commerce. New York, Ronald Press Co., $4.50.

This is a revision of the author's earlier text titled "Industrial Organization and Management." Actual case studies are used to illustrate the operations of many management functions. In the chapter given to "dispatching" a motor-vehicle company is the example used.

A directory of the German automobile parts and accessories industry has been published by the Reichsverband der Kraftfahrzeugteile-Industrie—RKI—EV, Berlin-Charlottenburg 2, Grolmanstrasse 6, Germany., under the title *"RKI Mitgliederverzeichnis und Bezugsquellennachweis,"* 1937.

It contains a list of the members of the Reichsverband (Industrial Association), then a list of producers with their full addresses, their trade marks, and a list of the products they make; a list of "sources of supply" arranged alphabetically according to the name of the article, and finally a glossary of automobile terms in German, English, French, Italian, Portuguese and Spanish.

Chevrolet Begins Plant

Ground has been broken for a new Chevrolet engine, gear and axle plant at Buffalo, N. Y. The plant will be ready for production next January. Capacity is rated at 1200 engines, axles and gear sets daily. The plant will employ 3000. It is being built on a 157 acre tract and as a building will provide 818,000 sq. ft.

The building will be largely one story brick and steel with a two story front section for locker rooms and a cafeteria. An administration building of two stories will be built in front of the plant.

Alfred C. Gulliver has been named manager of the new plant.

Tractor Rim Output Higher

Steady increase in production of tire rims for pneumatic tires used on tractors is reflected in the May report of inspections by the Tire and Rim Association. The gains over a year ago have now become exceedingly large.

Inspections of drop center tractor rims for May were 46,781 against 23,194 for May last year, and for five months the total was 218,074 against 91,221 last year.

Drop center passenger car rims of 16 in. diameter and under inspected were 1,747,355 against 1,248,581 in May, 1936. Five months' inspections were 8,555,990 against 5,597,960 last year. Inspection of 17 in. and larger rims in May were 49,983 against 397,768 last year, while for five months the total was 139,435 against 1,848,095.

Total truck rim inspections for May were 342,095 against 282,362 last year. Five months inspections were 1,844,124 against 1,637,905.

Ford to Exhibit in Paris

Ford products will be presented this summer at an exhibition on the Champs Elysees in connection with the Paris exposition, it was announced by the Ford Motor Company. The exhibition will be sponsored by Matford, the Ford manufacturing organization in France, with factories at Asnieres, on the Seine, and at Strassburg. The exhibition will be housed in a large display building which has been acquired as a permanent Ford Salon and which has been extensively remodeled.

Company Earnings*

	1937	1936
	Casco Products	
	2 mos. ended April 30	
Net income	60,597	35,925
Per share	35¢	21¢
	Allis-Chalmers	
Sales	17,788,395	11,633,167
Net income	1,504,897	754,127
Per share	85¢	56¢
	United Aircraft	
	12 mos. ended Mar. 31	
Net income	2,285,452	.....
Per share	91¢	
	American Coach & Body	
	years 1936, 1935	
Net income	145,790	112,919
	Evans Products	
Net income	122,552	255,917
Per share	50¢	1.04
	Ex-Cell-O	
Net income	108,837	2,221
Per share	28¢	
	Pines Winterfront	
	year ended April 30	
Net loss	316,308	181,710
	Reynolds Spring	
Net income	62,876	139,086
Per share	21¢	48¢

*For March quarter unless otherwise noted.

Give Trade-In Bonuses

Graham Dealers Pay Up to $100 for Good Condition

A new trade-in plan which gives owners of any make of car who have taken good care of their automobiles a bonus of as much as $100 extra, is being announced by Graham-Paige dealers.

Under the bonus plan when an owner seeks an appraisal of his car from any Graham dealer the first step will be to determine the official book valuation of the car. Then, after a careful inspection, additional allowances will be made by the dealer for many separate items which are found to be in good shape. These items include the paint, body, top, motor, clutch, transmission, etc. The condition of these features of the car will govern the amount of the bonus that the owner will receive from the dealer.

The new plan is being backed up with an intensive national advertising campaign. Full details of the plan are revealed in a series of newspaper advertisements the first of which appears Sunday, June 13. These advertisements will be released through leading newspapers which will secure coast to coast coverage.

Big "Twin Hornet" Developed

A new 42-passenger, 30-ton Douglas commercial air liner, the DC4, which is now under construction for five major U. S. air lines, will be powered with four Pratt & Whitney engines of a new model, capable of developing 1400 h.p. each. The new engine, known as the Twin Hornet, is a 14-cylinder, two-row radial type with a displacement of 2180 cu. in. It has a take-off rating of 1400 hp. at 2500 r.p.m. using 95 octane fuel and 1200 hp. using 87 octane fuel. Its normal rating is 1150 hp. at 2350 r.p.m. with 95 octane fuel.

It is understood that the engine has successfully completed a test equivalent to the standard Army and Navy type tests, on the company's own dynamometers. In addition it has been run for long periods at take-off power on both 87 and 95 octane fuel and in actual flight testing has shown itself to be smooth in operation.

Dividends Declared

		Record	Payable
Allis-Chalmers	50¢	June 15	June 30
Borg-Warner	q 50¢	June 15	July 1
Briggs Manufacturing	(incr.) $1	June 15	June 25
Evans Products	q 25¢	June 20	June 30
Ex-Cell-O	20¢	June 21	July 1
Fairchild Aviation	spl. ***	June 15	June 17
Greyhound	q 20¢	June 21	July 1
	q 13¾¢ prf.	June 21	July 1
Mack Trucks	q 25¢	June 18	June 30
Nachman Spring-F.	(incr.) 37½¢	June 15	June 25
Reyno'ds Spring	25¢	June 15	June 29
Ross Gear & Tool	q 60¢	June 30	July 1
United Aircraft	50¢	July 1	July 15
Willys-Overland	q 15¢ prf.	June 15	July 1
Yellow and Checker Cab	$1 acc. "A"	June 1	June 15
Young Spring & Wire	q 75¢	June 18	July 1

*** Payable share for share in stock of Fairchild Engine and Airplane Corp.

Strikes Curb Output

(Continued from page 861)

terials, affecting 2300 workers.

Two plants of the Ternstedt Manufacturing Co. employing 12,000 were closed by a sitdown strike on Tuesday when a UAW bargaining committee charged the management with failure to abolish piece work and to adjust wages. A brief unauthorized strike in the door department of the Briggs Manufacturing Co. was ended on the orders of a UAW organizer. Discharge of a union man resulted in a strike at the Apex Foundry on Tuesday. Negotiations were begun at once.

A strike vote was being counted late Thursday at the Bendix plant at South Bend, Ind. The union charges violation of a pact made after a strike last November in which, it is claimed, gave the union bargaining rights.

The National Labor Relations Board will handle the dispute at the Ford plant at Somerville, Mass. which arose over the discharge of 150 men.

A strike at the Canton, O., plant of the Timken Roller Bearing Co. was ended by vote of the CIO workers involved. The strike affected 7200.

Last Monday, June 7, Lansing, Mich. was literally "occupied" by UAW members when they called a one-day general strike in protest over the arrest of eight persons on picketing charges. Streets were blocked and stores forced to close.

In Flint, an estimated 35,000 union sympathizers heard Homer Martin and his assistants protest against landlords and store proprietors who raise prices, and against police activities. Walter Reuther, president of the Detroit West Side Local, threatened at the meeting to take to Dearborn "enough fighters to make it hot for Henry Ford."

The UAW is facing competition from a new independent union called the Ford Brotherhood of America, Inc. It was incorporated June 3 with the founders described as loyal Ford employees of long standing. UAW officials call it a "company union." The UAW is meeting the competition by waiving its $2 initiation fee and charging only the usual $1 a month dues.

On June 4, three Chrysler plants were closed until Monday, June 7 when union men in two of them protested against the remarks of two non-union women employees. A third plant, the DeSoto works, closed for lack of parts made at the closed Kercheval plant. Packard had to close assembly lines for the six and the 120 from Friday until Tuesday when 150 workers in the stamping division struck over a new wage classification. A Fisher Body Pontiac plant was affected June 4.

The McCord Radiator and Manufacturing plants, closed by strikes since May 28, resumed June 4.

The Ford plant at Richmond, Cal. resumed June 7 with conflicting claims as to terms of settlement.

Employees of Acklin Stamping Co., Toledo, voted 240 to 10 in a government election, June 9, in favor of the United Automobile Workers as sole bargaining agency. Mechanics Educational Society members were asked not to participate as an organization. They had taken the stand that the election should be by departments. The United States Circuit Court of Appeals refused to enjoin the election on appeal from the ruling in favor of a plant-wide election. Indications are that further court battles will be attempted to set the election aside.

PROBE of the fight between UAW organizers and Ford men at the Ford Rouge plant on May 26 brought Harry Bennett, left, Ford head service man, and Louis Colombo, attorney, to hearings before a Detroit Grand Jury. The battle resulted in personal injuries to union pamphlet distributors when they were ejected from Ford property.

Labor Turnover High

Government Survey Shows April Movements

Labor turnover in April in the automobile parts and equipment industry was the highest for the group of 16 manufacturing industries surveyed by the United States Department of Labor. The quit rate was 3.07 per 100 employes, the discharge rate .42, the total separation rate 7.53 and the accession rate 9.93. Plants producing rubber tires reported the lowest total separation rate, 1.09, and also the lowest accession rate, 1.51.

Lower lay-off rates than in the preceding month were reported by the automobile and bodies industry, as well as by the automobile parts and equipment and rubber tire industries. Accession rates were higher in all three than in March.

Total separation rates were higher in automobile and bodies, and in parts and equipment, than in April, 1936.

Following are the labor turnover rates per 100 employes for automobile and bodies, and for automobile parts and equipment, with comparisons:

	April, 1937	March, 1937	April, 1936
Automobiles and Bodies			
Quit	1.59	1.50	1.40
Discharge	.18	.23	.25
Lay-off	1.58	6.25	1.22
Tot. Separation	3.35	7.98	2.87
Accession	7.63	4.61	5.81
Parts and Equipment			
Quit	3.07	1.90	1.66
Discharge	.42	.43	.32
Lay-off	4.04	6.77	1.96
Tot. Separation	7.53	9.10	3.94
Accession	9.93	7.92	6.64

British Auto Plant Wages

The Ministry of Labor of the British Government has reported that in "motor engineering" the average weekly earnings of 163,000 individuals for the week ended Oct. 12, 1935 was 54s 5d ($14.43) per week. In establishments employing 10 or more workers the average was 65s 9d ($16.32), while in those employing less than 10 workers the average was 43s 1d ($10.81) per week.

Average hours of work for the entire motor industry, which includes "cycle and motor acecssories," were 47, with over a third of the workers in the smaller establishments averaging more than 48 hours. Almost half the total number of employees work 5½ hours overtime weekly.

The average rate of sterling cables for the October, 1935 week covered by the report was $4.90½. The sterling cable rate June 9, 1937, on which the dollar conversions were calculated, was $4.93½.

Business in Brief

Written by the Guaranty Trust Co., New York

General business activity last week was maintained at the high level of the preceding week despite the depressing influences of strikes, particularly in the steel industry. The weekly business index compiled by the "Journal of Commerce" stood at 105.5, as compared with 105.8 for the preceding week and 91.1 a year ago. Crop prospects are favorable. Heavy rains fell over a large area of the West where drought had persisted.

According to the Board of Governors of the Federal Reserve System, industrial activity in April and the first half of May was maintained at the relatively high level of recent preceding months. The board's seasonally adjusted index for April was 118 per cent of the 1923-25 average.

Car Loadings Increase

Railway freight loadings during the week ended May 29 amounted to 794,855 cars, which marks a gain of 15,579 cars above those in the preceding week, an increase of 148,043 cars above those a year ago, and a rise of 232,173 cars above those two years ago.

Production of electricity by the electric light and power industry in the United States during the week ended May 29 was 12.9 per cent above that in the corresponding period last year.

Lumber production during the week ended May 22 was 83 per cent of the 1929 weekly average. New orders were somewhat below those in the preceding week, and surpassed those in the corresponding period last year by only 1 per cent. Shipments and production were at about the levels in the preceding week but exceeded the figures for a year ago.

Average daily crude oil production for the week ended May 29 amounted to 3,573,700 barrels, as compared with 3,550,350 barrels for the preceding week and 2,943,950 for a year ago.

Fisher Index Dips

Professor Fisher's index of wholesale commodity prices for the week ended June 5 stood at 92.6, as compared with 93.3 the week before and 93.5 two weeks before.

The consolidated statement of the Federal Reserve banks for the week ended June 2 showed an increase of $1,000,000 in holdings of discounted bills. Holdings of bills bought in the open market and of government securities remained unchanged. Money in circulation rose $88,000,000, and the monetary gold stock increased $50,000,000.

Machine Company Adds Space

The Machining & Grinding Co., Detroit has placed a contract for a new building which will add 5000 sq. ft. of floor space to the 4000 feet now in use. The company began business in 1935 with four employes and now has 40 workers and is running on a 24-hour schedule. It specializes in automatic and handscrew machine parts and high grade production grinding and lapping for the automotive, aviation and general industrial trade.

General Body Plans

The recently organized General Body Corp. of Detroit which is to manufacture all-welded steel passenger trailers expects to start production at once. Distributors are now being contacted in key cities. The company has acquired the plant of the Welded Steel Barrel Co. which includes a site of 2½ acres. Three sizes of trailers are scheduled although production at first will be centered upon a 17-ft. trailer to sell at $1,195.

Evans Offers New Products

Organization of a new manufacturing and sales unit to be known as the Trailer Specialties section is announced by Evans Products Co. The new division will manufacture and distribute venetian blinds for house trailers, forced-air trailer heaters as well as static and power ventilators specifically designed for house trailers.

New Device Produced

The Penn State ignition delay indicator, an instrument used in tests of Diesel fuels, and which was illustrated and described in an article in AUTOMOTIVE INDUSTRIES of August 17, 1935, has been placed in production by the American Instrument Co., Silver Spring, Md.

Offers New Auto Finish

A new automotive finish to be known as Automotive Pyralux is announced by E. I. du Pont de Nemours & Co. Designed chiefly for touching-up synthetic resin finishes and for recoloring used cars, it combines the quick-drying qualities of lacquers and the lustre of synthetic resin enamels, requiring no rubbing. Its chalking resistance is comparable to that of baking enamel. The new finish is offered in black and 26 shades.

GM Sales Drop in May

Dealers' Inability to Build Stocks Probable Cause

Consumer sales of General Motors cars in May were well below those for April and for May, 1936, doubtless due in large measure to the inability of dealers to get enough cars for adequate field stocks. Sales to domestic dealers for May exceeded dealer sales to domestic consumers by only 1564 units in a month which is usually one of the largest production periods of the year. Strikes at various plants prevented output from reaching scheduled figures. Sales to consumers for the first five months of the year actually exceeded sales by the company to its domestic dealers by 562 cars, indicating a draft upon field stocks built up in the final weeks of 1936. Export sales were 2276 cars smaller than in April but were 1085 cars over the May, 1936, total.

Details of the May sales report were:

	May 1937	April 1937	May 1936	7 Months of Model Year 1937	7 Months of Model Year 1936
Sales to domestic dealers....	180,085	199,532	187,119	1,069,904	1,089,987
Sales to domestic consumers.	178,521	198,146	194,628	1,046,384	1,033,752
Change in dealer stocks.....	+1,564	+1,386	—7,509	+23,520	+56,236
Sales to foreign dealers.....	36,569	38,845	35,484	255,161	230,702
Sales to world dealers.....	216,654	238,377	222,603	1,325,065	1,320,689

:SLANTS:

HOW MUCH A DOZEN?—*It seems that a great airliner stopped at an Indian village one night, having lost its way. The crew wondered why the natives danced around the ship all night. It developed that the chief of the village felt that such a bird would be of considerable assistance to him in his next war, and all he was doing was trying to charm it into laying at least one egg for rearing purposes.*

GIFT—*Theatergoers in Los Angeles were only mildly interested to receive notice of a raffle of an automobile during a performance there. The car displayed in the theater lobby, however, was a 1926 Packard limousine. Suggested film for repeat performance, one of the old Wally Reid death-defying auto race pictures.*

TABOO—*The Amish sect, resident in Indiana, still has its taboo on automobiles. The Dunkards, slightly less strict, lifted it several years ago, but are considering now whether to abandon the taboo on radios. Involved in the radio matter is music, which is also taboo because of a ban on musical instruments.*

ON THE AIR—*CIO is watching the air waves closely before determining whether to make some sort of issue of the present ban by NBC and CBS on accepting Labor as a broadcast sponsor. Mutual and its regional stations adopt individual courses of action on this matter. CIO may ask why it cannot secure some place as an "institution."*

HEAVY REPAIR JOB—*Body repairs to a Lincoln-Zephyr, which had figured in a head-on collision at 80 m.p.h. with no loss of life, had to be done with the aid of 10 ton hydraulic jacks.*

BIKE TRAILER—*Bob Bellamy of Akron wanted to go camping but was tired of balancing his pack of equipment on the handlebars of his bike. So he built a trailer. It is stylishly stream-*

lined and finished and is protected by a rear bumper. The bike is a tandem with space for a second "motor".

THREE-WAY RADIO—*Police cars in Tuckahoe, N. Y., are being equipped with radio sets which permit transmission of messages from car to car, as well as from car to headquarters to car. They are said to be the first such installations in the world and have already been credited with life saving where seconds counted in message receipt.*

WHAT'S IN A TRAILER—*The National Highway Users Conference reports the following observed uses for trailers: Dentists, offices, libraries, laboratories ,traveling quarters for chicks, shoe-repair shops, beauty parlors, lunch counters, telegraph offices, artists' studios, photographers' dark rooms, meeting places for literary clubs, antique shops, radio stations, palm-readers' parlors, dressing rooms for movie stars, chapels, traveling offices for district attorneys and emergency operating rooms for doctors. The survey also shows that trailers are being used as demonstration centers and sales rooms for many products and commodities, including refrigerators, house paints, drugs, soaps and toilet goods, caskets, men's furnishings, and marine supplies.*

Automotive Metal Markets

Steel Buying for 1938 Cars Begins; Automobile Plants Little Affected by Mill Strikes Thus Far

Buying of flat steel for 1938 models has begun, with the first indication, as usual, the placing of moderate tonnage orders for automobile sheets. At the same time, there was some eleventh-hour covering in cold-finished and alloy steel bars against the fag end of 1937 model assembly requirements.

Only minor inconvenience has been caused so far to automotive consumers through delays in steel shipments from strike-affected mills. Companies with plants in the trouble zones have been able to shift much of the output scheduled for these to others of their mills where operations are unimpaired. In some cases, through friendly arrangements with competing mills, consumers in urgent need have been taken care of. Interruptions in operations of some of the automotive parts plants further relieved pressure on the steel mills. The American Iron and Steel Institute estimates 76.2 per cent of the country's total ingot capacity as operating this week, denoting a mild recession from its preceding week's estimate of 77.4 per cent. While impairment of operations in the areas most affected through the strikes is sharp, with Mahoning Valley plants operating at only 30 and those in the Cleveland-Lorain area at only 55 per cent of ingot capacity, the trade senses that the losses caused through the strikes occurred at the same time as the seasonal reaction in steel demand. Predictions of a spectacular rebound, should it be possible to overcome the gap caused by the labor troubles, hardly meet with general acceptance.

Pittsburgh and other districts that are free from labor disturbances, work at a relatively high rate because of the volume of business that comes to them from steel buyers who want to play safe. With the restoration of normal conditions, distribution of orders over the various steel-making districts would automatically return to what has come to be looked upon as regular. Prices are hardly mentioned in the market these days.

Pig Iron—Third quarter buying is a tame affair so far. Automotive foundries are well supplied with iron, and with second quarter prices formally reaffirmed for that beginning next month, there is little incentive to buy ahead of the time when the iron will be needed for melting.

Aluminum — While prices for primary aluminum remain unchanged, the market for secondary metal is a shade easier, the general industrial demand showing a tendency to taper off. Secondary melters have revised their scrap buying prices slightly downwards.

Copper—Foreign advices are to the effect that the British government has taken an attitude against production curtailment, so as not to jeopardize British rearmament plans. Producers, at least many of them, are also against artificial curtailment of output, fearing that it would give high-cost producers an opportunity to open up more and more mines, thus further disturbing the natural development of the industry. The market here is firm and quiet.

April Truck Exports Up 75 P. C.

April and Four Months Ended April, 1937-1936

	APRIL 1937		APRIL 1936		FOUR MONTHS ENDED APRIL 1937		FOUR MONTHS ENDED APRIL 1936	
	No.	Value	No.	Value	No.	Value	No.	Value
EXPORTS								
Automobiles, parts and accessories		$ 30,791,261		$ 22,972,198		$ 113,171,080		$ 91,152,902
PASSENGER CARS								
Passenger cars and chassis	22,654	13,105,249	17,583	10,152,605	81,900	48,243,347	68,098	39,524,495
Low price range $850 inclusive	20,565	10,724,144	15,925	8,294,871	74,577	40,064,453	62,014	32,786,690
Medium price range over $850 to $1,200	1,635	1,556,737	1,343	1,282,245	5,928	5,630,908	5,063	4,856,111
$1,200 to $2,000	323	501,523	203	295,838	1,009	1,562,600	672	982,241
Over $2,000	131	322,845	112	279,651	386	965,386	349	899,423
COMMERCIAL VEHICLES								
Motor trucks buses and chassis (total)	12,233	7,462,800	8,258	4,264,963	46,364	25,353,517	37,683	18,972,754
Under one ton	1,577	589,350	1,494	583,910	5,808	2,174,486	5,688	2,107,085
One and up to 1½ tons	7,717	3,732,240	5,238	2,464,449	32,494	15,023,388	24,637	11,294,412
Over 1½ tons to 2½ tons	1,970	1,732,556	1,244	879,152	5,716	4,622,630	5,167	3,651,394
Over 2½ tons	945	1,385,517	228	295,756	1,986	3,255,958	1,141	1,425,046
Bus chassis	24	23,137	54	41,696	360	277,055	1,250	494,817
PARTS, ETC.								
Parts except engines and tires		4,322,494		5,003,681		20,555,329		18,748,779
Automobile unit assemblies		4,128,835		2,334,913		12,020,500		8,364,338
Automobile parts for replacement (n. e s.)		506,221		331,623		2,100,707		1,391,004
Automobile service appliances								
Airplanes, seaplanes and other aircraft	53	1,672,302	32	368,134	166	5,696,951	114	1,601,043
Parts of airplanes, except engines and tires		3,118,811		317,829		10,301,924		1,272,114
INTERNAL COMBUSTION ENGINES								
Stationary and Portable								
Diesel and semi-Diesel	81	154,974	26	28,341	261	572,676	135	483,078
Other stationary and portable								
Not over 10 hp.	3,524	154,528	846	52,786	9,024	415,891	3,570	245,035
Over 10 hp.	445	220,400	136	66,433	986	524,026	1,010	343,648
Automobile engines for:								
Motor trucks and buses			964	98,930			9,899	953,753
Passenger cars			4,646	254,310			21,615	1,488,148
Engines and aircraft	106	563,004	38	135,210	366	2,023,332	214	1,028,820
Accessories and parts (carburetors)		248,150		186,098		887,799		658,843
IMPORTS								
Automobile and chassis (dutiable)	77	52,676	56	19,271	433	284,464	205	81,744

40 Years Ago

with the ancestors of AUTOMOTIVE INDUSTRIES

"On Motor Traffic,"

A paper by Sir David Salomons, President of the Self-Propelled Traffic Association (England)

Many devices have been put forward for constructing a road engine which shall lay its own rails as it proceeds. Some of the methods are very ingenious . . . In some cases planks or rails are laid and raised as the wheels pass along . . . All the advantages to be gained by the use of movable rails or other equivalents can be obtained by modifications in the wheels, without the auxiliary. At the same time there is much to be said in favor of some of the proposed schemes . . . If a combined locomotive and wagon is to be taken over a ploughed field to collect produce, the process might be impossible if the ground were soft; yet if the planks were laid along the route to be taken the difficulty would be overcome.

From *The Horseless Age*, June, 1897.

Production Troubles

(Continued from page 861)

cars, so that no appreciable let-down is in prospect for the balance of June.

Domestic retail deliveries of **Buick** motor cars during May totaled 22,543 cars, compared with 23,397 in the previous month and 17,513 in the corresponding period a year ago, according to W. F. Hufstader, general sales manager. This was a decline of approximately 850 cars, or three per cent from the previous month and a gain of 5,030 or 28.7 per cent over May of last year. Mr. Hufstader said that Buick May volume was controlled by the ability of the factory to make delivery, the factory entering June with 28,500 unfilled orders, the largest bank of business for this month in many years. He said he expected June would show an increase in deliveries over both April and May, with the probability that this month would establish the year's peak. Buick's domestic retail sales during the month exceeded shipments to dealers by approximately 1,000 cars, Mr. Hufstader said, with output for the month totaling 23,213 units including export shipments. He said it was expected June production would exceed that of May.

Paul G. Hoffman, president of the **Studebaker Corporation** reported the sale of 8,577 passenger cars and trucks in May compared with 8,708 in May, 1936. This brings the total sales for the first five months of 1937 to 46,498, compared with 40,011 in the first five months of 1936—a gain of 16 per cent.

Retail sales and factory shipments of **Hudson and Terraplane** cars for week ended May 29 set new records for 1937, according to W. R. Tracy, vice-president in charge of sales. Total retail sales of 3445 cars during the week were the largest for any week of 1937 to date and showed the sixth successive weekly increase. In the same week 4187 cars were shipped from the factory, the largest production for any week of the current year. Retail sales for the full month of May totaled 13,501 cars, a gain of nearly 45 per cent over the preceding month. Factory shipments totaled 15,331 cars, a gain of 64 per cent over April and 25 per cent over May last year.

A total of 9173 automobiles were shipped by the **Nash Motors Company** in May, C. H. Bliss, vice-president in charge of sales, announced. This is an increase of 127 per cent over shipments in May, 1936, and brings shipments to date for the 1937 model year to 69,816, an increase of 72 per cent over total shipments for the entire 1936 model year.

All records for **Reo** truck and bus shipments for the past eight years were shattered last month according to Elijah G. Poxson, general sales manager for the Reo Motor Car Company. Shipments for May, 1937 exceeded those of any previous month since May, 1929.

Total production of **Willys** cars from January 1 to June 7 was 44,068 cars, and total production of the present model has been 48,088 cars. The original schedule for the model year of 60,000 units will be exceeded by a considerable margin, said David R. Wilson, president. Mr. Wilson announced the beginning of production on a coupe model of the present series, and said that plans are under way to add a panel delivery and cab pickup commercial car on the standard chassis for the fall show.

Sales of **Graham** supercharged cars for the present model year through May 20 show an increase of 63.8 per cent to 3444 units over the total for the comparable period a year ago, reports F. R. Valpey, vice-president and general sales manager of the **Graham-Paige Motors Corporation.**

Cadillac-LaSalle sales during the first 20 **days of May topped the similar** period in April, which was the heaviest retail business month in the 34-year history of the company's dealer organization. According to an announcement by sales manager D. E. Ahrens this week, dealers delivered 3108 cars through May 20 against 3055 over the same number of days in April.

Vitamin A Rides Road

Physicians Say Lack of It Causes Night Accidents

Not new to the medical profession is the fact that human diets deficient in Vitamin A produce among other maladies, night-blindness, or inability of the eye to adjust itself to darkness. But on June 7, Doctors W. J. Ezickson, urologist, and J. B. Feldman ophthalmologist, amplified public knowledge of its implications by demonstrating to the American Medical Association's Atlantic City convention two machines for testing the ability of the human eye to "see in the dark," because of their finding that from 10 to 12 per cent of the people coming to a well-known eye hospital suffer more or less from night blindness and Dr. Ezickson's opinion that "a good proportion of these should never be allowed to drive after dark."

The normal eye can adjust itself to the dark in about five minutes, the physicians said. Unsuspected night blindness can be disclosed in a few minutes with the aid of one of the test machines designed for police use in examining drivers. The eye deficient in Vitamin A does not adjust itself readily and after being subjected to headlight dazzle, for example, the possessor may be found driving on the wrong side of the road because he cannot locate the margins or hitting a pedestrian because he honestly couldn't see him.

The doctors' studies show that Vitamin A deficiency in the eye is an irreversible condition, and cannot be corrected by use of fish-liver oils, for example, normal sources of enriched Vitamin A diets.

Disclosing that a serious attack of illness may reduce the Vitamin A content of the eye, the physicians indicated that drivers of public-service vehicles should be examined for night-blindness after illness, before being allowed to return to the road.

Found in fatty foods and in a few vegetables, Vitamin A has become known as the ophthalmic vitamin. Exhaustive experiments have isolated it in a state about 90 per cent pure, evolved the empirical chemical formula $C_{20}H_{30}O$ to describe its composition.

The Fitzgerald Manufacturing Co. has issued a new catalog on its line of **grease retainer products.***

Descriptions of **insulated cable accessories and connections,** together with specifications and prices, are included in a new catalog of the Anaconda Wire and Cable Co.*

Socony-Vacuum Oil Co., Inc., is distributing a new, **illustrated wall lubrication chart** for automobiles.*

Description and uses of **activated alumina** are described in a booklet of that name published by the Aluminum Co. of America.*

A **handbook of common machine fasteners** has been issued by the Russell, Burdsall & Ward Bolt and Nut Co. It is intended as part of a draftman's equipment.

A catalog of new **welding apparatus** has been issued by the Thomson-Gibb Electric Welding Co.*

The Sundt Engineering Co. has published a **vibration study** with which is combined other industrial applications of the neobeam oscilloscope.*

Circulars are available describing a double-housing hydraulic planer, a 36 in. hydraulic open-side shaper, a pull-down broaching machine and a 12 in. hydraulic shaper manufactured by the **Rockford Machine Tool Co.***

The Cochrane-Bly Co. has issued a bulletin describing its single and duplex universal vertical **shaper-millers.***

Tools for straightening automobile and truck parts are described in a new circular by the John Bean Manufacturing Co.*

An indexed catalog of **gages** and their applications has been published by the Sheffield Gage Corp.*

The Ideal Commutator Dresser Co. has issued a revised edition of its **catalog,** which also contains data on electrical and motor maintenance.*

The **hardness of boron** is described in the latest issue of "Diamonds in Industry," published by J. K. Smit & Sons, Inc.*

New applications for **storage battery power** are reported in a booklet published by the Edison Storage Battery division of Thomas A. Edison, Inc.*

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

Form Brockway Committee

A committee has been formed to represent the preferred stockholders of the Brockway Motor Truck Corp. It consists of J. J. Livingston as chairman, Joseph G. White and Charles H. Andrews. Secretaries of the committee are Gerland I. McCarthy, 60 Broad St., New York, and Edward J. Bullock, 308 State Tower Bldg., Syracuse, N. Y.

Plymouth High Wheel Line

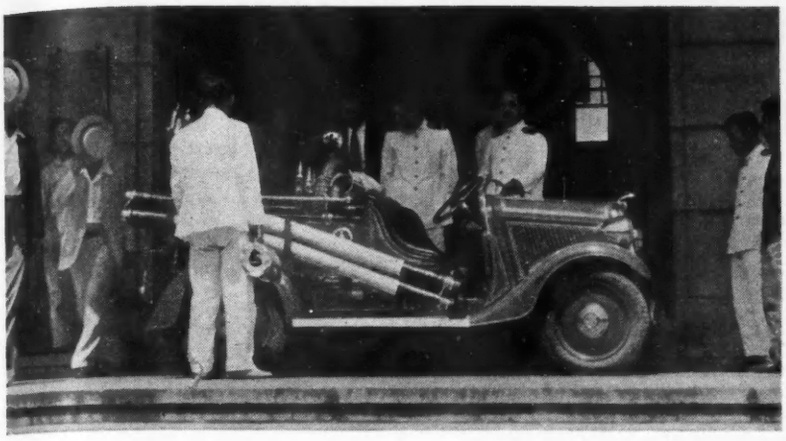
Plymouth division of the Chrysler Corp. has developed a high-wheel model for back country road use. The special models have a clearance of 9⅞ in., using 20 in. disc wheels. A special gear ratio of 4.3 to 1 is provided. Special shock absorbers are provided.

Texas License Tests Begin

Governor James V. Allred of Texas has signed the motor vehicle driver's license bill, which was passed at the recent regular session of the legislature. It went into effect immediately. It provides that all new applicants for licenses shall be required to take an examination to consist of tests of eyesight; ability to read highway signs and traffic directions; ability to understand, and knowledge of, traffic laws; and tests for physical defects.

Rowland Buys Spring Unit

William and Harvey Rowland, Inc., of Philadelphia has purchased the replacement spring business of the Detroit Steel Products Co. Herbert Rowland and W. H. Courtwright of the purchasers, and F. E. Badger and E. R. Ailes of the Detroit company consummated the agreement.



FIRE-FIGHTER on a Japanese Datsun passenger car chassis, designed for those small island and Manchukoan communities which cannot afford full size fire engine equipment. It has a wheelbase of 79 in. and has a special pump drive which provides an 80 ft. head of water. The engine has four cylinders, is rated at 16 hp.

AC Improves Air Cleaner

A new replaceable element type air cleaner has been announced by the AC Spark Plug Co., Flint, Mich. Its design is such as to simplify air cleaner maintenance and thus encourage periodic servicing.

This air cleaner has been in production for some months and is in use on 1937 cars, the public announcement having been withheld up to this time.

With previous designs it was quite a difficult matter to service the air cleaner due to the necessity for disassembly of air cleaner and silencer parts to get at the filter. The new design permits a more simple service procedure. By releasing the butterfly nuts, the replaceable element is immediately exposed and may be easily removed. It is then replaced by a new element which comes in a waxed container and is already oiled.

The entire procedure is said to be very rapid and inexpensive, and in some instances even less expensive than the former practice of disassembling the cleaner and silencer and washing the filter.

FRANK B. WILLIS, vice-president in charge of sales of the Bendix Products Corp., announced the appointment of five divisional sales supervisors. George L. Everback will be in charge of sales in the brake and brake lining divisions; C. R. Markham in the B-K Vacuum Power Brakes and Stromberg Carburetor section; H. W. Rothkopf in the Bendix-Feragen and Bendix-Cowdrey equipment division; D. E. Johnson in radio products sales, and J. F. Held in marine products.

NORMAN A. LINCOLN has been appointed director of purchases for the Hupp Motor Car Corp. He has been with the company for 19 years, joining it in 1918 as a courtsey car driver. J. R. Ackerman has been named assistant director of sales.

T. E. WISNER has been named service merchandising manager of the Chrysler Motors service division, it was announced by T. W. Moss, general service manager. Mr. Moss also announced the appointment of A. E. Cook as regional supervisor.

W. C. LEINGANG has been appointed manager of automotive manufacturers' sales by the Electric Storage Battery Co.

GEORGE R. BROWDER has been made assistant general sales manager of Oldsmobile in charge of retail selling. He has been with the company since 1919.

HOWARD A. FLOGAUS has been named coach engineer of Reo Motor Car Co. He has been with Yellow Truck & Coach for the past seven years.

S. W. WARNER is now secretary of the Timken-Detroit Axle Co. That post was given up by Walter F. Rockwell who retains his vice presidency.

JOHN E. DUNBAR has been made purchasing agent for the White Motor Co. He has been assistant general manager of the Aviation Manufacturing Corp. of Williamsport, Pa.

R. H. CROOKER, executive vice-president of the Campbell-Ewald Co., has temporarily assumed the duties of president with the title of acting president, due to the illness of Henry Ewald, president.

E. L. LUDVIGSEN has been appointed vice-president and general manager of the Fuller Manufacturing Co. He has been vice-president in charge of sales.

P. G. FITZPATRICK has established the Fitzpatrick Thornton Tandem Fleet Sales Co. with headquarters in New York.

J. E. GOLOB has been appointed sales engineer for the Bridgeport Thermostat Co., Inc., and will make his headquarters in Detroit.

R. CLEMENTS REICHEL has been named general sales manager of the General Body Corp. He has just completed a study of the trailer market.

J. F. BOWES has been made director of service for Hupp Motor Car Corp. He has been with the company since 1922.

SID G. HARRIS is now Eastern representative for Macmillan Petroleum Corp., Los Angeles. He is located at the New York office, 50 W. 50th St.

HENRY I. BOUCHARD has joined the Detroit office of the Federal Products Corp.

Car Financing Larger

April New Car Paper Gains Slightly; Used Cars Soar

April retail automobile financing, reported through the Department of Commerce by 456 companies covered 449,094 cars, and averaged $404 per car to total $181,344,266. This compared with 424,100 cars, an average of $407 and a total amount of $172,409,113 for March. It also compared with 446,956 cars, an average of $405 and an amount of $180,926,890 for April, 1936. Wholesale automobile financing for April was $182,102,402, against $199,022,247 in March and against $194,323,329 in April of last year.

New car financing for April covered 187,759 cars, averaged $580 and amounted to $108,927,349. In March the figures were 184,280 cars, an average of $576, and an amount of $106,175,514. A year ago the financing covered 209,307 cars, averaged $573 per car, and amounted to $119,894,021.

Used car financing in April covered 259,256 cars at an average of $277 per car, totaling $71,690,770, against 237,795 cars in March, an average of $275 per car and a total of $65,506,682. Used car financing in April last year covered 234,766 cars at an average of $256 per car and totaled $60,052,639.

Total retail financing for four months was $565,354,974 against $516,734,576 for the first four months of 1936. Of this, new car financing was $336,380,159 against $332,910,511 for the like period of last year. Wholesale financing for the longer period was $667,449,441 against $593,208,837 in 1936.

Hupp Cars to be Previewed

The reorganized Hupp Motor Car Corp. has had made available to approximately $2,692,000 of new funds for working capital through the completion of its common share underwriting, Tom Bradley, president, announced. Production of the new cars is slated to begin in July. Announcement is scheduled for August. The cars will be previewed on June 15.

All necessary tooling for production of the new six and eight-cylinder models is about completed. Several hundred men are at work on plant machinery and equipment and working forces are steadily being augumented with a total of 2500 expected to be on the payroll when car production starts next month.

With over 200,000 Hupmobiles now on the road, Bradley has estimated that the present projected 1938 model production could be absorbed entirely by replacements. Profitable operations can be carried on next year with an output of 15,000 cars.

William B. Mayo, who for 19 years was associated with the Ford Motor Co. prior to his retirement five years ago to attend to his own affairs, will become consulting engineer for the Hupp.

Truck Expense Charted

Average cost of operating a 1½-ton truck for a year has been found to be 7.72 cents a mile with labor cost alone 2.94 cents a mile, according to records on 15 trucks of different makes compiled by John L. Liles of the Illinois College of Agriculture.

Mr. Liles reported that the range of cost per mile varied from 5 to 11.9 cents, depending largely on the number of ton-miles. He found that the larger the mileage, the higher the net earnings. The trucks represented livestock haulers, but livestock made up only about 40 per cent of their hauling. Grain accounted for 14 per cent, mineral materials 29 per cent and other commodities 17 per cent.

April Stock Transactions

Pierre S. du Pont, a director of the General Motors Corp., disposed of 10,195 shares of common stock in April, and retained 103,067 shares, the monthly compilation of officers and directors dealings by the Securities and Exchange Commission showed. Mr. du Pont also reported the holding of another 110,340 shares through a trust. In January, an amended statement showed, he acquired 1425 shares and disposed of 1633.

Marvin E. Coyle, an officer of the company, received 2563 shares in April as a bonus, while A. C. Anderson, also an officer, received 544 shares as a bonus. Albert Bradley ,officer and director, received 1285 shares as a bonus and sold 326 of them. R. K. Evans, an officer, received 396 shares as a bonus R. H. Grant, officer and director, received 876, O. E. Hunt, officer and director, received 1285 and sold 321, Charles F. Kettering, an officer, received 522, Wiliam S. Knudsen, now president, received 3846, James D. Mooney, officer and director received 863, M. L. Prentis, officer, 682, John J. Schumann, Jr., a director, 1176 ,and C. E. Wilson, officer and director, 1285.

Thomas F. O'Neil, a director of General Tire & Rubber, gave away 2080 shares of stock last December in six equal amounts.

Several officers and directors of Parker Rust Proof Co. acquired small blocks of stock as follows: C. H. Awkerman acquired 200, M. C. Baker 200, B. D. Chandler 100, W. M. Cornelius 200, A. V. Foster 200, G. E. Luke 200 and A. V. Moninger 100.

AUTOMOTIVE INDUSTRIES

Looking Ahead

ELECTRIC BRAKES took a new lease on life with the advent of the tourist trailer and its remote-control braking problems. How electric brakes have been engineered to the new requirements will be described in our June 26 issue.

PRECISION and Pratt & Whitney are not only alliterative but practically synonymous in the aircraft engine field. In the issue of July 3 will be a description of P. & W.'s Hartford plant, coupled with a description of manufacturing operations at the Cummins Engine plant, Columbus, Ind.; both offered as a double bill in the manufacturing series which appears in each first issue of the month.

Chicago Coach Adds Buses

An order totaling over $1,000,000 has been placed by Chicago Motor Coach Company, Chicago, Ill. with General Motors Truck Company, Pontiac, for additional rear-engined mono-drive transmission buses, according to John A. Ritchie, president of the coach company. Delivery of the new units is scheduled for about October first. Included in the new order are 40 double deck buses, increasing the total in service to 140, and 30 new single deckers with a seating capacity of 41 passengers. When the new units just ordered are delivered, 80 per cent of Chicago's bus mileage will be operated with new rear-engined vehicles.

Spring Starter Introduced

A new automatic spring starter, "Quick," for internal combustion engines has been developed in Germany and is now being introduced in this country. It uses a coil spring which must be wound up by hand and when is released by pushing a button.

Calendar of Coming Events

SHOWS

Morocco, Automobile Section, Tangier Fair, Tangier .....June
France, Automobile Section, Bordeaux Fair, Bordeaux .....June 13-28
Belgium, First International Aeronautical Salon, Brussels.....June 18-30
Fourth ASTM Exhibit of Testing Apparatus and Related Equipment, New York .....June 28-July 2
Second Winter Item Show, Automobile Accessories Association, Chicago, Aug. 9
Poland, Automobile Salon (Foire Orientale), Lwow .....Sept. 1-15
Yugoslavia, Automobile Section, Autumn Fair, Ljubljana .....Sept. 1-12
Yugoslavia, Automobile Section, Commercial Fair, Belgrade.....Sept. 11-21
France, 31st International Automobile Salon, Paris .....Oct. 7-17
Great Britain, 31st International Automobile Exposition, London....Oct. 14-23
Czechoslovakian Automobile Show, Prague .....Oct. 16-24
National Automobile Show, New York, Oct. 27-Nov. 3
Toledo, O., Automobile Show..Oct. 27-Nov. 3
Italy, 10th International Automobile Salon, Milan .....Oct. 28-Nov. 8
Boston, Mass., Automobile Show, Oct. 30-Nov. 6
Los Angeles, Cal., Automobile Show, Oct. 30-Nov. 7
San Francisco, Automobile Show, Oct. 30-Nov. 7
Cincinnati Automobile Show.Oct. 31-Nov. 6
Great Britain, 13th International Commercial Automobile Exposition (trucks and buses), London...Nov. 4-13
Chicago Automobile Show.....Nov. 6-13
Akron Automobile Show.....Nov. 6-12
Omaha Automobile Show.....Nov. 6-11
Brooklyn Automobile Show.....Nov. 6-13

Show Business

Manager of the National Automobile Show in New York is Alfred Reeves, 366 Madison Ave., N. Y. C. Inquiries concerning all matters connected with the national show should be addressed to him. AUTOMOTIVE INDUSTRIES will be pleased to furnish names and addresses of local show managers on request.

Columbus Automobile Show .....Nov. 6-12
Detroit Automobile Show.....Nov. 6-13
Kansas City, Mo., Automobile Show, Nov. 6-13
Motor Truck Show, 4th Annual, Newark, N. J.....Nov. 6-12
Newark, N. J., Truck Show.....Nov. 6-12
Buffalo, N. Y., Automobile Show..Nov. 6-13
Indianapolis, Automobile Show....Nov. 6-13
Newark, N. J., Automobile Show..Nov. 6-13
Philadelphia Automobile Show....Nov. 6-13
Pittsburgh, Pa., Automobile Show.Nov. 6-13
Toronto, Ont., Automobile Show..Nov. 6-13
Great Britain, 36th Scottish International Automobile Exposition, Glasgow .....Nov. 12-20
Baltimore, Md., Automobile Show, Nov. 13-20
Cleveland, Ohio, Automobile Show, Nov. 13-20
Jersey City, N. J., Automobile Show, Nov. 15-20
Milwaukee, Wis., Automobile Show, Nov. 17-24
Springfield, Mass., Automobile Show, Nov. 14-20
St. Louis, Mo., Automobile Show.Nov. 14-21
Portland, Ore., Automobile Show.Nov. 14-21
Denver, Colo., Automobile Show, Nov. 15-20
Montreal, Que., Automobile Show, Nov. 20-27
Kansas City, Mo., Automobile Show, Nov. 24-Dec. 1

CONTESTS

31st Annual Grand Prix of the Automobile Club of France, Linas-Montlhéry .....July 4
Roosevelt Raceway, 300-Mile George Vanderbilt Cup Sweepstakes (Rain date July 5) .....July 3
National and International Soap Box Derby Finals, Akron, Ohio.....Aug. 15
Pan American Cup Race, Roosevelt Raceway .....Sept. 6
National Outboard Championship Regattas, Richmond, Va.....Sept. 18-19

CONVENTIONS AND MEETINGS

Second World Petroleum Congress, Paris, France .....June 14-19
Automotive Engine Rebuilders Association, 15th Annual Convention, Chicago .....June 21-24
American Society for Testing Materials, 40th Annual Meeting, New York, June 28-July 2
U.A.W. Annual Convention, Milwaukee, Aug. 23
American Transit Association, 56th Annual Convention, White Sulphur Springs, W. Va.....Sept. 19-23
S.A.E. Fuels and Lubricants Regional Meeting, Tulsa, Okla. ...Sept. 30-Oct. 1
S.A.E. National Aircraft Production Meeting, Los Angeles, Calif.....Oct. 7-9
S.A.E. Annual Dinner, Commodore Hotel, New York.....Oct. 28
American Petroleum Institute, 18th Annual Meeting, Stevens Hotel, Chicago .....Nov. 9-12
S.A.E. National Production Meeting, Flint, Mich. .....Dec. 8-10

Just Among Ourselves

Reciprocal Trade Progress

BENEFITS accruing to the automotive and allied industries through the patient pursuance of Secretary Hull's reciprocal trade agreement policy have reached the point where they can be assembled into an impressive tabulation of tariff concessions made by foreign countries to assist the trade-flow of automotive products.

In the tabulation, which was issued originally as a special report of the division of foreign tariffs to the Bureau of Foreign and Domestic Commerce, and which has been reprinted recently by the Overseas Automotive Club, 34 groups of products are shown as having benefited by reciprocal trade agreeements. Sixteen countries have signed such agreements with the United States, if we include Costa Rica and El Salvador, where the agreements are not yet effective.

The products affected range all the way from motor vehicles and parts, tractors and parts, to the tools and gadgets which have a part in the repair of vehicles and the gasoline which runs them. Reductions in duties of 25 per cent are spotted through the table with pleasing frequency.

In a world torn by economic and military bickering, it's startling to find that friendly argument, based on the possibility of common advantages to follow, can produce such effective results.

Among the large American export markets included in the agreements are Brazil, Canada and France. It is too much to hope, we suppose, that many other large countries are in a mood for peaceful solution of trade problems. But meanwhile the departments of Commerce and State go ahead with the collection of data and the conduct of negotiations which do eventually bring results.

Said Secretary Hull to us in November, 1936, "The active support given by automobile manufacturers to the Government's program of trade agreements continues to be a source of gratification to me.

"It is typical of the progressive attitude of your industry that it should be in the forefront in realizing that increased foreign trade is necessary to the restoration of our country's prosperity."

We can add to this a postscript which Secretary Hull is not in a position to comment upon. The reciprocal trade work of the Department of State has furnished a splendid example of effective cooperation between an American industry and government authority for the benefit of the industry and the nation as a whole. Would to God, in the language of the eighteenth century, that there were more such examples available from the Washington sector.

—H. H.

General view of one section of the die-casting department in which twelve Schultz machines are located. These are used chiefly for small to medium size castings shifted in tote boxes to the general cleaning department where any machining required is also done. Molten metal is supplied to the machines from a ladle carried on the monorail between the two rows of machines.

Alemite's Effective

By Herbert Chase, M.E.

PRODUCTION in a die-casting plant necessarily differs in many respects from that in most other plants serving the automotive industry primarily. This is partly because there is a constant change in the type and general design of the castings required. For this reason, the whole layout of the plant must be kept more or less flexible in the sense that the equipment must be adaptable readily to the production of one group of parts today, another tomorrow, next week or next year. In general, the equipment must be capable of quick change to meet production schedules for a very wide range of castings.

In these respects, the plant of the Alemite Die Casting & Manufacturing Co. is not an exception to the general rule among the larger producers of die castings. Although the output is about 50 to 60 per cent automotive, the remainder is purposely and wisely kept diversified in non-automotive lines, partly to avoid seasonal fluctuations characteristic of the automotive industry and to keep the plant busy at times when automotive requirements are low.

Although this plant produces both zinc and aluminum-base die castings, the zinc alloys are by far the most widely used and almost all the automotive die castings are in the zinc alloys, hence these are given primary consideration in this article. The business of the plant consists in handling virgin metals, melting and alloying them according to strict standard specifications, converting them into castings, freeing the latter of gates and fins and performing such relatively minor, though important, machining operations as may be required. In the Alemite plant, unlike those of most large die casting producers, there is included an important group of departments for finishing (chiefly plating) a considerable part of all the die castings produced, including, of course, buffing and other operations necessary in preparing the castings for plating.

In this, as in many die casting plants, it was formerly the practice to feed the casting machines with solid metal only, melting this in pots attached to each machine. Today, the casting machines, though each has its own melting pot, are supplied with molten metal. This helps to keep metal temperatures more nearly constant and requires only a single melting at the time the alloys are produced.

Melting is accomplished and the alloying done in seven 5000-lb.-batch furnaces in the case of the zinc alloys. In addition to these, and used only when production demands exceed the capacity of the equipment for supplying molten metal, or in the event of a breakdown or other emergency, there is a four-furnace unit designed to cast ingots on a semi-automatic basis in a water-cooled chain conveyor at the rate of 3000 lb. of alloy per hour. When required, these ingots are trucked to the casting machines, whereas normally these are supplied with molten metal conveyed to them in a ladle on a trolley which travels between the machines and the melting furnaces close to them. Machines are equipped with automatic control units for maintaining a substantially constant metal temperature through variation in the supply of gas to the pots on the respective machines.

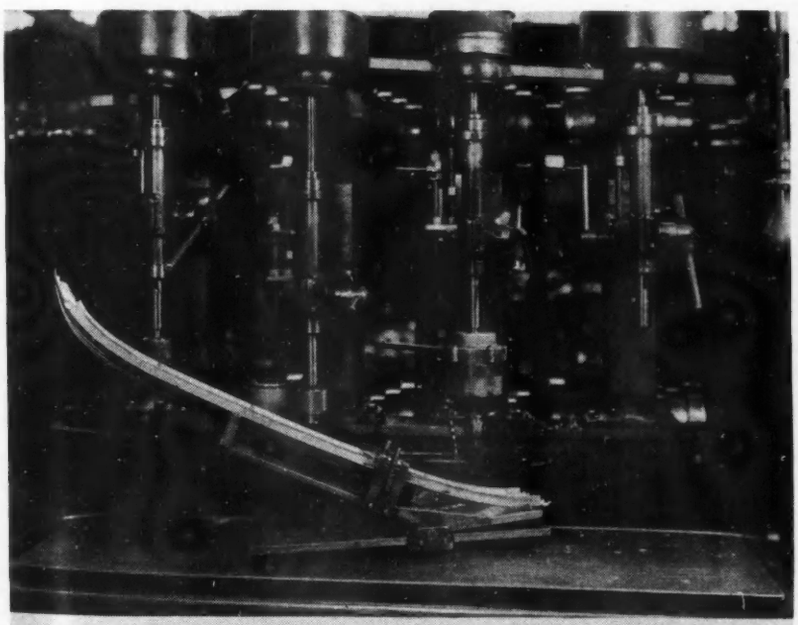
There are, of course, separate die-casting machines for the aluminum alloys and these are supplied from melting furnaces used only for these alloys. The machines using aluminum are so segregated as to keep the aluminum and zinc castings separate until sprues and gates are removed and the major cleaning operations on the castings are performed. Several different types of die casting machines are employed and for the most part they are grouped according to types.

In keeping with the trend toward the use of hydraulically operated die casting machines employing high-pressure plungers for forcing the molten zinc alloys into the dies, twenty-six new machines of this class have been added during the last two years. Remaining machines are of a mechanically operated type and are equipped with goosenecks arranged for injection of molten metal under direct air pressure. This same type of machine is used not only for zinc alloys in some cases but also and invariably for those of aluminum with which a gooseneck type of machine is required.

Closeup showing front half of the die used for casting one of the D-shaped grille moldings used on Dodge cars. The die has an irregular parting conforming to the curve of the casting.

All of the die casting machines used for zinc alloys are grouped convenient to the melting furnaces for zinc alloys. The cleaning of some castings (that is, removal of sprues, gates and fins), including certain machine operations, is done adjacent to and in the same department with the casting machines, but most small castings are loaded into tote boxes at the machines where, in some cases, gates and sprues are broken off. When filled, the tote boxes are trucked into a separate cleaning and machining department to which later reference is made. Certain of the castings, however, especially those which are quite bulky and are required in large quantities are fed as rapidly as produced to immediately adjacent machines and benches where the removal of sprues and gates and the cleaning of fins is accomplished and such drilling and tapping as may be required is done. When clean, many of these castings are hung on overhead chain conveyors which carry them to polishing and buffing departments. By cleaning close to the casting machines, the handling of bulky parts by trucks is avoided, as is also the practice of stacking castings of such a nature that deformation might result while the casting is still warm.

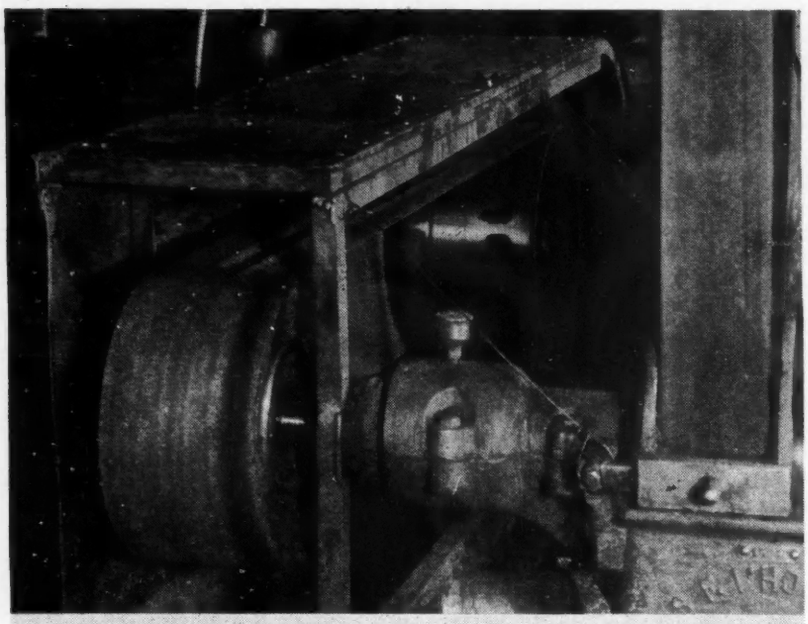
Layout for Die Casting



Setup for drilling and tapping operations on the curved grille used on Dodge trucks. Of special interest is the rocking fixture with stops at several positions, made necessary by reason of the holes being at various angles. The fixture is slid along the bed of the machine.

An arrangement of this kind, though economical in handling, requires considerable space near the casting machines and more or less rearrangement of equipment for cleaning as the type of casing being handled is changed. This is minimized, however, by using this setup, as a rule, only for parts in long-run production. For some castings such as the Dodge grille moldings, light but bulky D-shaped castings, very simple cleaning equipment suffices. These Dodge moldings provide an excellent illustration of the functioning of a particular cleaning layout for a bulky piece in large production.

Casting is done in this instance by a battery of two of the small size hydraulic machines having enough locking pressure to permit of some overhang in the rather long die required.



Buffing wheel setup with a sanding belt running over it to an iron pulley of the same diameter. As the wheel is soft, the belt deforms to fit the casting surface being sanded.

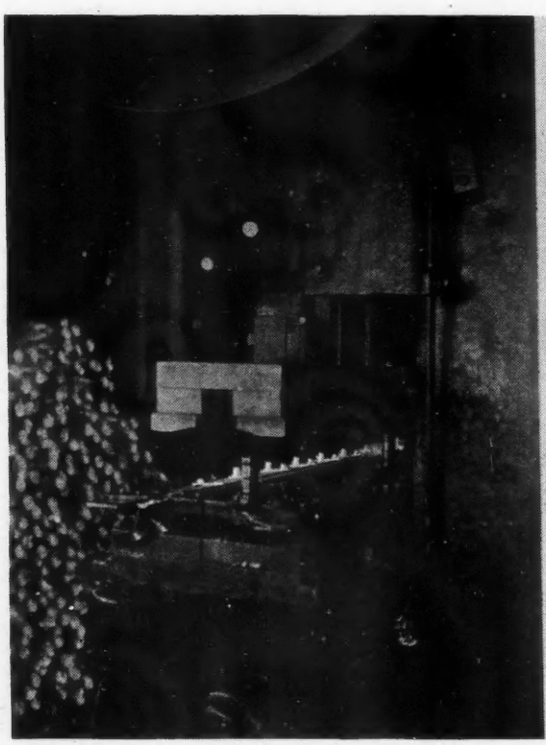
One machine makes the right and one the left casting of each pair, and some 1400 pairs can be turned out by two machines in an eight-hour shift. As the section thickness of these castings averages hardly more than 1/32 in., they cool quite quickly, but to avoid warping they are hung on racks and when cool are passed to adjacent punch presses provided for shearing the flash and gate from the castings. As thus cleaned, the castings are passed to workmen at an adjacent bench where any remaining burrs are filed off.

Each molding has 12 bosses with cored holes and these have to be tapped. As the molding is not flat, it was thought that a special machine set-up for rapid tapping would be required. It was found, however, that the simplest form of horizontal single-spindle tapper, the type driven by a pair of friction disks, one each side of a friction wheel on a motor shaft, for reversing the tap as required, and with the work guided entirely by hand, met all requirements, for with it a good operator can tap the 12 holes in each piece at the rate of some 400 frames an hour, or as rapidly as they are passed to him from the two machines. Upon completion of the tapping, the grille is hung on the conveyor which carries it to the polishing room.

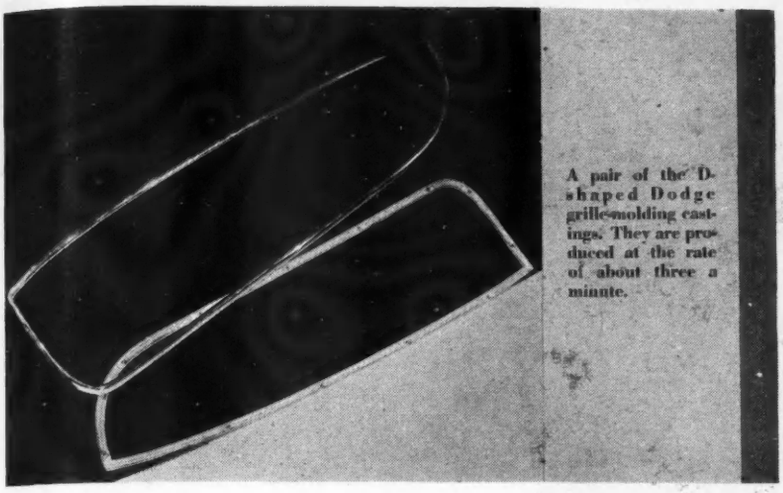
Long louver casting used on Chrysler models and the narrow grille employed on Dodge trucks are similarly handled, but at a less rapid rate. There are, of course, much heavier and more complex castings. The louvers are cleaned of flash in a stamping die, but still require considerable hand filing to remove burrs. The gate, being at one end and quite heavy, is sawed off. As these castings run up to 42 in. in length and are quite rigid, besides being curved, a special setup is required for tapping holes at correct angles, the work being done in drill presses which drill as well as tap some holes.

Small castings, on which the machine operations are quite varied, are handled in a machine shop in a separate wing of the plant. Where quantities are sufficient to warrant a special setup or sequence of tools, this is sometimes made, but in general it is more convenient and as economical to first clean the casting of fins, usually by forcing it through a shaving die in a punch press, or doing some similar operation in such a press and then shifting the casting to a more or less fixed setup of tools for such other machining as is needed. A large proportion of the machining consists of drilling and/or tapping, done mostly in drill presses, some of which have several spindles for simultaneous or successive use. Very convenient for some work are the light motor driven drill presses which are inexpensive and easily shifted about and plugged in as required. These are quickly adapted to a series of drilling and/or tapping operations where the work has to be shifted from fixture to fixture.

In other cases, presses with a series of spindles on a common bed meet requirements better. In such cases as curved castings with holes at odd angles, many of which are used in auto-



Cleaning die in a punch press for shearing flash from the latticed louver moldings, 42 in. long, used on Chrysler cars. Two castings are cleaned simultaneously, one being shown in position in the die.



A pair of the D-shaped Dodge grille-molding castings. They are produced at the rate of about three a minute.

motive applications, it is often found convenient to use a special rocking fixture with stops at various angles. This fixture can be shifted along a flat bed and quickly set for a sequence of operations under several spindles.

Other machines used for cleaning or machining operations include disc grinders, belt sanders, lathes and Kingsbury units, the latter for drilling and tapping at angles in different planes. Sometimes the work is passed from operator to operator and in others is returned to a tote box for shifting to another machine further away. Castings to be plated are often protected against scratching by use of corrugated board between layers of castings.

Polishing and buffing prior to plating is done for the most part by conventional methods in a separate department. One noteworthy innovation is the use of a sanding belt running over a cloth buffing wheel on a buffing head at one end, an iron pulley at the other, the two being spaced on four-foot centers and the pulley turning in a bearing with an eccentric holder and a weight arranged so as to take up slack. The sanding belt is about 6 in. wide and runs over a 12-in. wheel and pulley. As the wheel is soft, the belt deforms as pressure is applied on the piece being ground against it, tending to conform to an irregular surface much as the buffing wheel itself would do. This gives an advantage over a grinding wheel, which is relatively rigid. It also presents a much larger surface to the work, the belt being some 11 feet in length. In consequence, it requires less frequent changing than a grinding wheel. Instead of applying new abrasive, as with a grinding wheel, the belt is replaced by a new one when it ceases to cut rapidly enough. It lasts, as a rule, for six to eight hours of grinding if care is used not to cut it by applying excessive pressure with a sharp edge of the casting. Cutting also averages faster than with a conventional grinding wheel.

Although some castings require grinding to prepare them for buffing prior to plating, wherever possible the grinding is confined to removal of the parting line, as grinding sometimes uncovers fine pores which mar the plated surface. Many castings for plating are produced with so smooth a surface that only a light buffing is needed prior to plating. Since the development of bright nickel plating on a satisfactory commercial basis, it has been possible in some few cases to produce acceptable die-cast hardware parts without buffing or coloring them and, of course, with a corresponding saving in cost.

Plating in this plant follows advanced practice and meets the exacting specifications of the automobile manufacturers and other engineering departments. It involves most careful chemical control and constant checking of the results secured, to meet these requirements. Complete details cannot be given here, but enough may be said to indicate the general practice followed.

All castings to be plated are first cleaned by vapor degreasing in a commercial solvent commonly employed for this operation to free the die casting of grease and buffing compounds. This is followed by a very short electrolytic cleaning with a proprietary cleaner and a rinse in hot water before plating is begun. Plating is done with commercial semi-automatic equipment under extremely close control and with careful tests to see that the plating specification set by the customers are followed. Initial coating is always with copper which is applied to a thickness of 0.0003 in. minimum and is fairly bright, as this helps to assure a good bright nickel when this is to be used.

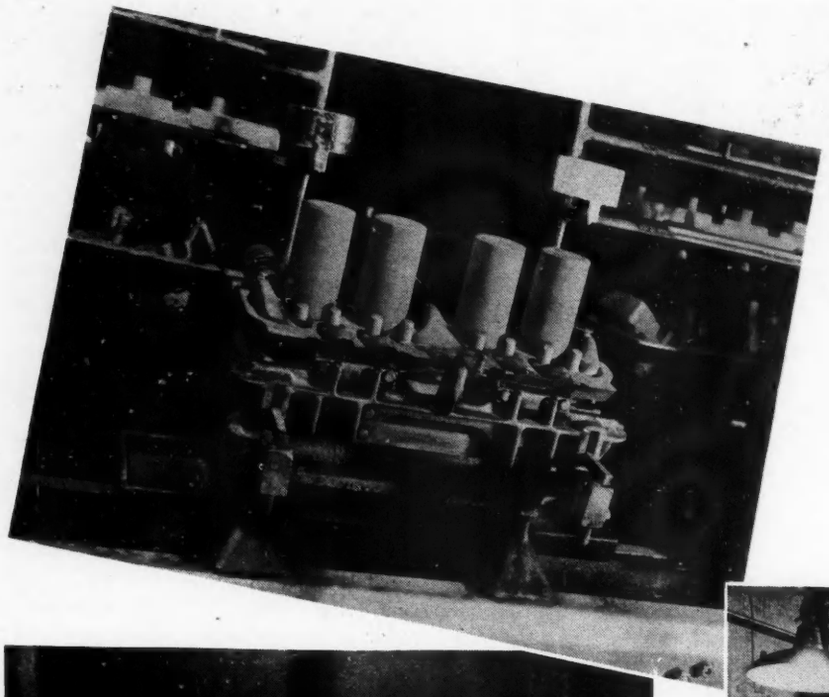
Although both dull and bright nickel plating is done in this plant, the latter has been developed to a point where it is quite successful and yields the advantage that the castings can go directly into the cromium bath without the buffing or coloring required when dull nickel is employed, with a consid-

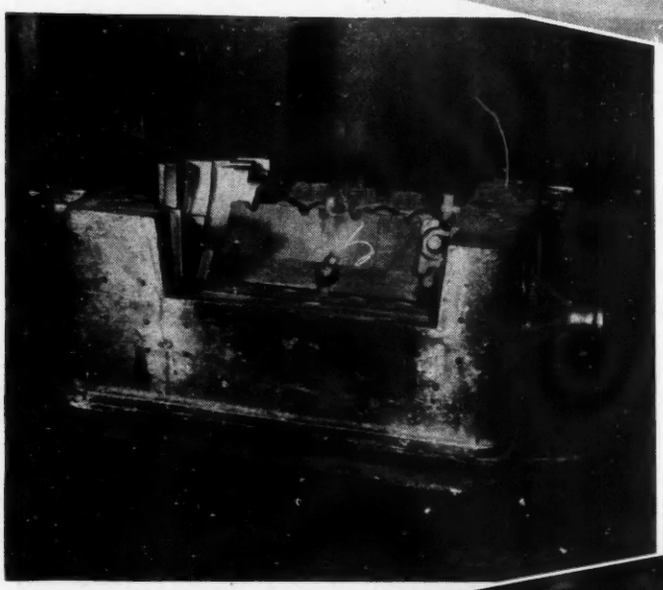
(Turn to page 887, please)

Hansen-Van Winkle-Munning plating machine used for bright-nickel plating of die castings previously plated with copper in a similar machine at the left.

Ford "60"

By Joseph Geschelin





(Upper Left) Partial assembly stage of cylinder block core. These are built up completely on metal fixtures mounted on the moving chain conveyor. Individual core pieces are fed to the line on mono-rail-suspended trays shown in the rear

(Center Left) Heavy conveyor serves as assembly line for cylinder block dray. The final station is shown here

(Lower Left) Automatic molding machines are used for preparing molds for the 60 HP. V-8 block

(Center Right) One of first operations in machine shop is to machine bottom and top gasket faces in separate settings on this huge drum type milling machine

Engine Production—

Shop experience on larger power plant solves problems on the smaller model

ONE of the announcements of the 1937 new model season last fall, concerned the introduction of the 60 hp. Ford V-8 engine groomed for economy options on both passenger cars and Ford trucks.

At this writing, the 60 hp. engine constitutes about 25 per cent of current V-8 Ford production.

It was rather difficult for those outside the Ford organization to understand how a high-grade V-8 could be produced at a cost compatible with the present delivered price of the economy Ford line. And it is the purpose of this brief article to show how the experience accumulated in the production of the well-known 85 hp. engine has been directed to the most economical set-up for producing the smaller engine.

To those familiar with the manufacture of the 85 hp. engine, the photographs found here will show that precisely the same type of equipment, scaled down proportionately in size, is used on the 60 hp. unit. Those familiar with the foundry problems involved in casting a modern V-block can appreciate how helpful it was to draw upon the experience acquired in the production of the larger block. Nevertheless, the small casting brought new problems due to its relatively finer sections and smaller core elements.

These new conditions were faced with the confidence of previous experience and have resulted in foundry practice that is both economical and eminently successful.

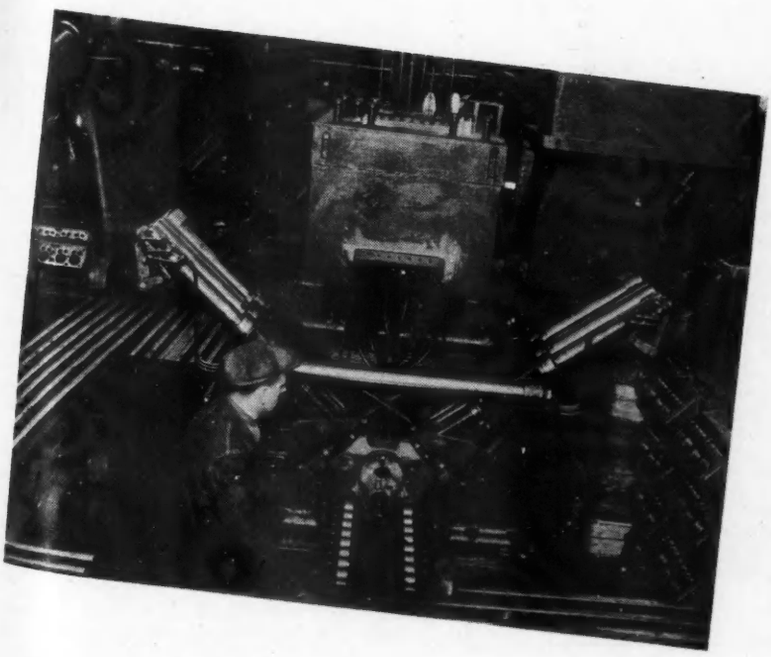
As in the case of the 85 block, the 60 block is a one-piece casting. The dry-sand core is composed of 55 separate core pieces—the same number as required for the larger block. It is cast from a mixture to which 15 per cent of steel has been added, poured at a temperature ranging between 2590 and 2610 deg. Fahr. Composition of the metal runs as follows:

	Per Cent
Silicon	1.80 — 2.10
Sulfur (max.)	0.010
Phosphorous	0.25 — 0.32
Manganese	0.60 — 0.80
Carbon	3.15 — 3.40
Copper	0.50 — 0.75

To assure good control of the desired metal mixture, and temperature, the foundry utilizes the continuous pouring equipment which was developed for the larger block. This comprises a reservoir of about 35 tons of molten metal flowing continuously into a traveling car ladle, synchronized with the pouring conveyor, filling the molds while in motion. The car ladle has a shuttle-like action on a short rail traveling to the end of the rail and then returning to the forward end to continue its cycle. According to Ford metallurgists, the continuous pouring cycle in combination with the large reservoir of molten metal produces an enviable control of composition and temperature quality.

Quality control is a feature of every operation in making up the molds for this block. Core pieces are molded individually in steel forms, baked, and inspected. Then the core pieces are subassembled in sets, on the table conveyors shown here, using steel forms and again subject to rigid inspection. Finally, the core assembly itself is dried for a short interval of time.

Sub-assemblies of core sets then are



(Left) One of the most ingenious automatic machines to be found anywhere in the industry is the equipment for automatically installing exhaust valve seat inserts. Rings are loaded into the liquid-air freezing chamber, overhead in background, and then dropped into individual valve seats down the chutes which may be seen leading from the chest to the fixture. Inclined hydraulic cylinders are used to press the rings home

Factory Routing

Ford V-8, 60 Hp. Cylinder Block

1. Broach eight (8) bosses.
2. Mill top and bottom.
3. Drill two (2) ¼-in. Oil Holes, one (1) 5/16-in. Oil Hole, two (2) 31/64-in. Locating holes, six (6) 23/64-in. main bearing stud holes.
4. Drill and spotface ⅝-in. oil pressure hole, start ¼-in. hole, ream breather hole to 1.344 in. and ream locating holes to ½ in.
5. Mill six (6) exhaust pads.
6. Mill R & L banks.
7. Inspect oil and main bearing stud holes.
8. Straddle mill front and center main bearings and rough mill rear main bearing and oil seal.
9. Mill both ends.
10. Rough bore cylinder bores.
11. Chamfer top and bottom of cylinder bores.
12. Inspect cam clearance.
13. Rough drill and line ream main and camshaft bearing holes.
14. Inspect main and camshaft bearings.
15. Rough and finish face camshaft gear holes, face camshaft bearing —front, finish oil seal and bore six (6) ⅜ in. gear cover fit dimensions.
16. Inspect.
17. Drill and ream hole and assemble oil pipe.
18. Drill and spotface two (2) motor support holes and drill oil gauge hole.
19. Rough and finish bore sixteen (16) valve chamber holes and cut valve clearance.
20. Drill sixteen (16) valve guide bushing and push rod holes.
21. Semi-ream sixteen (16) valve guide bushing and push rod holes.
22. Fly-cut bushing and push rod holes.
23. Rough counterbore eight (8) exhaust valve holes for inserts.
24. Spotface R & L banks on inside for spring seats.
25. Ream sixteen (16) bushing and push rod holes and finish bore exhaust insert holes and intake valve holes.
26. Inspect operation No. 25.
27. Remove from conveyor and assemble eight (8) exhaust valve inserts.
28. Inspect insert assembly.
29. Drill eleven (11) "F" two (2) ¾-in., one (1) ¼-in. hole in top, Drill thirty-four (34) 5/16 in. holes in R & L banks, Drill twelve (12) "F" holes in exhaust port pads.
30. Drill intake and exhaust port holes, drill and ream fuel pump hole and ream oil pressure hole.
31. Drill thirteen (13) "F" and one (1) 21/64-in. holes in bottom, Drill one (1) 21/64-in., four (4) 5/16-in. and two (2) 23/64-in. holes in rear end, drill two (2) ¼-in. and one (1) 5/16-in. hole in bottom, drill eight (8) "F" and one (1) ¼-in. and two (2) 1.905-in. holes in front end.
32. Chamfer all bolt holes and spotface one (1) motor support hole.
33. Drill eight (8) ⅜-in., four (4) ½-in. and two (2) 3/32-in. steam holes.
34. Grind intake ports by hand to remove any rough surfaces.
35. Mill circular grooves for main bearing caps.
36. Mill retaining slots in three (3) main bearings and oil pocket in rear main bearing.
37. Ream two (2) 1⅛-in. expansion plug holes in bottom.
38. Drill two (2) 1½-in. and two (2) 7/16-in. holes in exhaust port banks.
39. Tap two (2) 1½-in. and two (2) 7/16-in. holes in exhaust port banks.
40. Assemble expansion plugs in bottom.
41. Counterbore six (6) main bearing stud holes.
42. Ream six (6) main bearing stud holes.
43. Tap eight (8) 5/16-18-in. holes and one (1) ⅛-in. pipe thread in front end, tap thirteen (13) 5/16-18-in. and six (6) 7/16-14-in. holes in bottom, tap four (4) ⅜-16-in. holes and one (1) ⅛-in. pipe thread in rear end.
44. Tap thirty-four (34) ⅜-16-in. holes in R & L banks, tap twelve (12) 5/16-18-in. holes in top face, tap twelve (12) 5/16-18-in. holes in exhaust port pads, tap one (1) ¾-16-in. oil pressure regulator hole, tap one (1) 11/16-16-in. fuel pump hole.
45. Wash.
46. Rebore cylinder bores.
47. Diamond bore cylinder bores.
48. Polish cylinder bores.
49. Inspect cylinder bores.
50. Wash.
51. Insert oil line plug.
52. Spray cylinder bores with oil (automatic).
53. Drill and ream fuel pump push rod bushing hole.
54. Hand ream fuel pump push rod bushing hole.
55. Inspect.
56. Water test.
57. Final inspections.

routed to the floor conveyor assembly lines for the drag and cope. These are built up individually using steel gages at various stations to assure perfect alignment.

After shake-out and cleaning in the foundry, the castings proceed to the machine shop. The major operations in this department will be found on the routing sheet which is reproduced in tabular form.

The first operation on the rough casting is the finishing of eight locating boss surfaces on horizontal hydraulic surface broaching machines. In this operation, the casting is located in the fixture from the inside surface of the rough bores so as to assure a reasonable control of cylinder wall thickness in subsequent operations.

With this operation as a guide, the block is routed to the first of the massive vertical drum-type milling machines which mills, first the bottom surface, then the top surface in the same machine but on the other face of the two-sided drum fixture.

Having established these surfaces, the block enters a drilling machine. Here it is lined up on the milled surfaces and centered from the same roughbore location as on the broaching machine. Then two locating holes are drilled to serve as the locating points in the fixtures of all subsequent machine settings.

Following the practice first developed upon the introduction of the 85 engine, the final operations in finishing the cylinder bores are handled in the air-conditioned and temperature-controlled department which now finishes both the 85 and 60 blocks. This department, first described in AUTOMOTIVE INDUSTRIES, July 27, 1935, houses a large battery of automatic 16-spindle, single-point boring machines in which the bores are finished perfectly round and true within 0.0002 in. of specified dimensions by means of single-point fly cutters tipped with cemented carbide.

Today this department contains the original large machines for the 85 block and the new machines, scaled down in size, for the 60 block. From the boring machines, the blocks go directly to a battery of new hydraulically operated honing machines, under the same controlled atmosphere conditions, even to an accurate temperature control of the kerosene mixture with which the honing tools are flooded. Bore diameter is held within 0.0005 in. of specified size in the honing operation.

It is of great interest to learn how much the single point boring procedure has simplified the preliminary work on the cylinder bores. The first operation on the bores is rough-boring, following the drilling of the locating holes, as may be noted on the routing. There is only one additional operation, that of

reboring, following the completion of major machining operations, and immediately preceding single-point boring.

One of the most impressive operations in the line is on the battery of huge cam-and-crank boring machines which do their work automatically, the function of the operator being solely that of feeding the machine. There are two principal stations in the machine—rough-bore and finish-bore. Immediately following the rough-bore which entails heavy metal removal, the block enters a trunnion-mounted fixture, is clamped automatically and turned over. This permits the accumulation of chips to drop out, the operation being further facilitated by the action of an air blast at the instant of turning over. The fixture automatically goes back into position and permits the movement of the block into the finish-bore station.

Another very interesting point is the method developed by Ford for assembly of the eight hard exhaust valve seat inserts. Here we find an automatic, mechanized process quite different from anything used elsewhere in the industry. The rings are fed to a large overhead chamber containing liquid air which chills them at 320 deg. below zero Fahr. The blocks are held in a fixture directly below this chamber. Upon movement of a control lever eight rings move down individual chutes leading directly from the chamber to the bore which receives the ring.

As the rings drop into place, they are pressed home by means of hydraulically operated rams and given a hammer like blow to insure perfect bottoming.

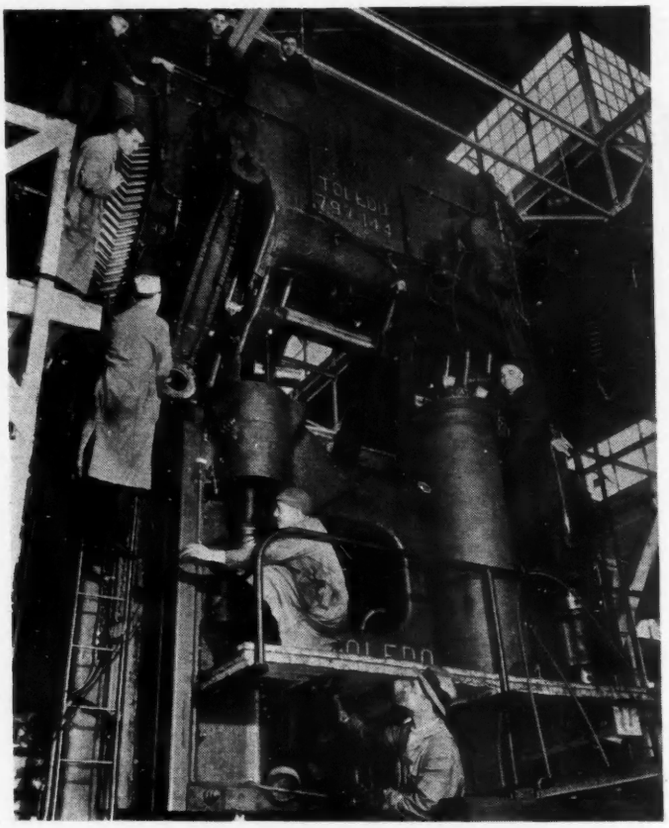
Due to the design of the Ford V-block, some of the drilling and tapping operations have to be handled on five-way, automatic machines. Among these will be found drilling and tapping machines having a total of 60 spindles, each.

To the visitor in the motor department, the best conception of Ford quality will be found in the detail of the final inspection line where the blocks are checked point by point as they move down the long line, comprising some 19 stations. At each station you will see the inspector look for the one detail in which he is interested. The combination of visual and mechanical inspection along this line leaves no doubt whatever as to the control of quality and faithful adherence to specifications.

(Above) This gage is used to check 74 bolt holes in the cylinder block in relation to the bottom face and crankshaft bearing bolt hole

(Center right) Each cylinder bore is inspected by means of the magnetic gage shown here to assure uniform and adequate cylinder wall thickness

(Lower right) Closeup of several stations of the long final inspection line. After going through the machine shop, all blocks are transferred to the inspection conveyor and checked 100 per cent



Workmen are busy on six different levels of this giant press, which is even taller than this picture shows. It bites down on steel with a pressure of 3,000,000 pounds, to form the new Plymouth one-piece steel top. The bite is made by the two halves of a massive dye, weighing 172,000 pounds

Production Lines

Knows Answers

What we enjoyed most about the Summer Meeting paper — "Fundamentals of Vehicle Performance," by Merrill Horine of Mack—is the fact its entire objective could be summarized in just one sentence, although the proof and demonstration require many words and much technical background. In our own mind we could summarize the argument by the statement—Let the vehicle operator specify the conditions of his operation and leave it to the judgment and experience of the motor truck manufacturer to specify the vehicle units. And it's a good suggestion, judging by the trend of discussion.

Surface Finish

Goal of designers and production men has been the matter of a standard method of specifying surface finish for interchangeable and mating parts. Many methods have been proposed in the past, and among these, one of the most promising has been the Profilograph. However, the drawback to many of the proposals is the fact that the measuring device usually is a laboratory instrument and far too costly for factory application. It was with a great deal of interest, therefore, that we heard about the Profilometer—an intrument capable of measurements to the millionth part of inch, yet portable and sufficiently rugged for factory use. Its readings are given directly on a dial gage which may be graduated or provided with colored areas for the range of tolerances.

By Thousands

Continuous production of molded plastic parts from a single machine at the rate of thousands of pieces per minute is the next step, according to a note in a recent issue of the *Industrial Bulletin*. For small moldings of simple form, the molding machine is a modification of a heavy duty rotary tabletting machine of the same general design as is used for making pharmaceutical tablets and candies. The molding composition feeds from a hopper into a rotating turret containing several mold cavities. At subsequent positions of the turret, the mold is closed, the full forming pressure exerted, and the mold opened for ejection.

E-P Lubes

We have all heard plenty about E-P lubes for the modern passenger car. However, our ears pricked up when we got wind of the fact that E-P has become a factor in the lubrication of certain types of machine tools. Wherever this lubricant can be used, it is said to reduce friction to an unusually low level. This angle seems well worth further investigation.

On Transmissions

Cadillac evidently started something last year with the introduction of a transmission having the cover at the bottom and with shifter mechanism on the side. It is quite likely that several car builders will feature for '38, a transmission with shift mechanism on the side to facilitate the installation of attachments without interfering with floor board clearance.

Tool Grinding

Some time ago, Carboloy developed a new and simplified technique for the accurate grinding of cemented-carbide tool tips. Now the technique is being spread by means of a sound film that's practical and instructive. Very soon this film will be made available for use at technical society meetings.

Special Alloy Iron

Following established Ford practice, the crankshaft for the new 60 hp. V-8 engine is a casting made from a special alloy iron analysis similar to the material originally developed for the 85 hp. engine. This analysis is as follows:

Carbon	1.35-1.60 per cent)
Copper	1.50-2.00
Silicon	0.85-1.10
Manganese	0.60-0.80
Chromium	0.40-0.50
Phosphorous	0.10 max.
Sulfur	0.06 max.

Baked cores are used in building up the molds. As in the case of the 85 hp. shaft, the mold for the small shaft is made up of 16 individual core sec-

(Turn to page 887, please)

Injection Pumps

are discussed by French engineer at S.I.A. Meeting

A NUMBER of interesting facts concerning injection pumps and injection equipment in general were brought out in a paper presented at a recent meeting of the (French) Society of Automobile Engineers by M. Outin of the firm "Précision Mécanique." This firm manufactures a plunger-type injection pump in which the discharge per cycle is controlled by turning the plunger around its axis. The body or housing is made in two parts, for the sake of accessibility.

From the camshaft in the lower part, motion is transmitted to the pump plungers through the intermediary of pushrods of chilled cast iron. The moving parts being very light, the pump can be operated at the high speeds which modern engines require. The upper end of the plunger, instead of being flat, is milled off to two oppositely inclined surfaces. There are two oppositely located circular suction parts in the upper part of the housing, which are uncovered by the pump plunger as the latter approaches the end of its down stroke, and the pump barrel then fills with fuel. During the following delivery stroke the upper part of the plunger closes the suction port, and fuel is then forced from the cylinder through the delivery valve. Theoretically the pump during each cycle delivers a quantity of fuel equal in volume to that of a cylinder having the same diameter as the plunger and a height equal to the difference between the height of an element of the plunger circumference opposite the inlet port and the diameter of that port. In regular operation, however, various causes operate to modify this "theoretical delivery." Delivery of the pump is controlled by turning the plunger around its axis, and it is a peculiarity of this pump that the injection timing varies automatically with the quantity setting.

The P.M. pump is so timed that for full load it gives the same injection advance as another pump in which the timing is not affected by the quantity control, and for part load the injection advance is then less with the P.M. pump, which obviates the possibility of excessive combustion pressures.*

A double ball delivery valve is used, the two valves being arranged in series and preventing a serious return flow when the pressure is relieved, thus maintaining the line pressure between injections. There has been much argument regarding the pros and cons of what is known as "reaspiration," and virtues have been assigned to it which it does not actually possess. Its only merit is that it makes it possible to do with less accurate workmanship. This may be explained as follows: In Fig. 2 the cylindrical surface of the plunger is shown developed, and it can be seen that the generatrix of this surface which is active under full-load conditions has an overlap represented by *ab*. The generatrixe effective at idling has a much smaller overlap, *a'b'*. Calculation shows that this overlap *a'b'* amounts to only a few tenths of a millimeter. To assure equal delivery of all units of the same pump, very careful workmanship is essential. On the other hand, with a pump working with "reaspiration" there will be a greater overlap, because in addition to the actual

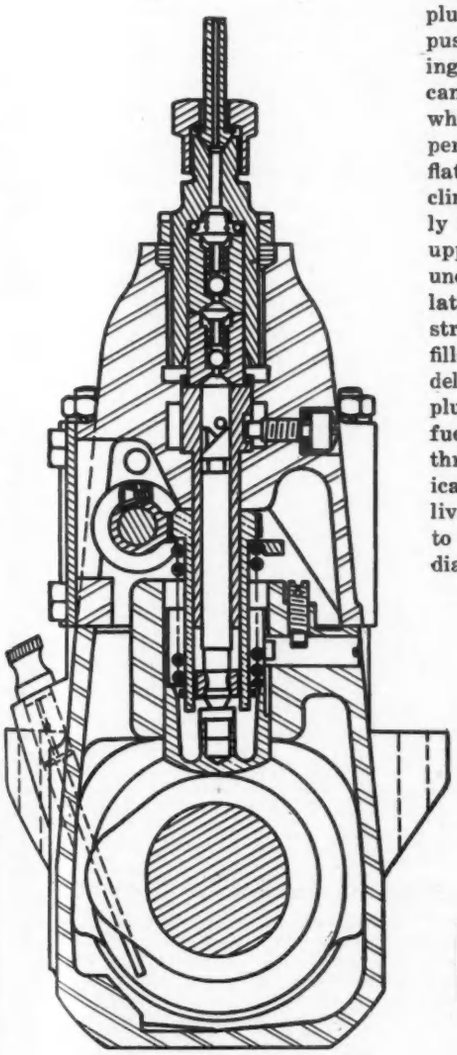
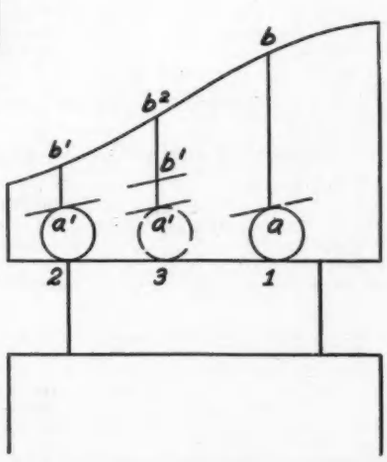


Fig. 1—Transverse section of P.M. injection pump

Fig. 2—Port-overlap diagram



* Some other manufacturers hold that the injection should be advanced as the load decreases, for the reason that at part load there is no risk of excessive pressures and the economy of operating can be increased by using a greater advance.—Editor.

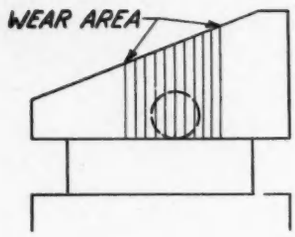


Fig. 3—Plunger-wear diagram

delivery $a'b'$ at low speed the plunger must displace a volume b_1b_2 corresponding to the "reaspirated" quantity of fuel. This gives an overlap as shown for position 3 in Fig. 2, and with this greater overlap the fit need not be so close.

Pure gas oil does not cause any wear of parts with which it comes in contact, and if injection pumps handled only absolutely put oil they would last indefinitely. If a sample of gas oil sold as commercially pure is passed through a filter paper, a reddish deposit forms on the paper. Evidently it originates from the filtering earths used in clarifying petroleum products and not removed by the filtering presses. If the deposit is examined under a microscope crystals of white quartz are discovered which may be roughly grouped into three size classes, viz., crystals having diameters of the order of 1/10, 1/100, and 1/1000 mm. respectively. Solid particles of the first group would clog the orifices of injection nozzles, but, fortunately, they are readily removed by any good commercial fuel filter. Particles of the second size class do not clog the injector orifices but have an injurious effect on the injector valve, making necessary repair operations of appreciable cost. It is the solid particles of the third class, with diameters of the order of 1/1000 mm., that are most destructive to the pump elements, and in order to find out how they act is is only necessary to examine a worn pump plunger. It will be found that in the normal operating position, corresponding to about three-quarters full load, a series of longitudinal score marks have formed in line with the inlet port and over a small width to both sides of it (Fig. 3).

During the delivery stroke, because of the high pressure above the plunger and the necessary clearance between plunger and cylinder bore, there is a slight leakage of fuel past the plunger back to the inlet port, and this leakage current carries along with it solid impurities of a diameter less than the clearance between cylinder wall and plunger. Larger particles cannot enter the clearance. These fine particles have a continual abrasive effect on the cylinder and plunger, and it is therefore very important that filters be provided in the fuel system which will remove the smallest foreign particles.

In a filter manufactured by the P.M. firm the fuel is passed first through a thick layer of cotton wadding, where the solid particles attach themselves by capillarity to the cotton fibers. The fuel is next passed through a double layer of linen cloth of very fine weave. As most of the impurities in the fuel are removed by the wadding, the linen filtering element becomes coated slowly, and the filtering element need be removed only about 10,000 miles of vehicle operation.

Reference was made above to factors which have an influence on the delivery characteristics of a pump. All of these are dependent on speed. Some of them tend to increase the delivery, others to decrease it. For a given clearance and pressure, the leakage is proportional to the time during which it can take place; consequently, it tends to decrease as the speed increases, so that the delivery tends to increase with speed.

Theoretically delivery begins the moment the upper edge of the plunger covers the suction port, but in reality injection begins slightly later at low, and slightly earlier at high speeds. As a result, delivery tends to increase with speed. On the other hand, when the speed increases the injection pressure increases, thus increasing the leakage. This, therefore, tends toward a de-

(Turn to page 888, please)

ENGINEERING DRAWING SERIES

For the convenience of our readers who may wish to refer to drawings of passenger car, truck and aircraft engines which have been reproduced in the current series, we present herewith the complete publication schedule dating from Nov. 21. A tentative schedule for the next three months from June to August, inclusive, is appended.

Engine Drawings Published in Automotive Industries

Engine	B. Hp. at Specified R.P.M.	No. of Cyls., Bore and Stroke (in.)	Date of Publication	Page No.
Packard	100-3600	6—3 7/16x4¼	Nov. 21	717-718
Chrysler	93-3600	6—3⅜x4¼	Nov. 28	753-754
Buick	100-3200	8—3 5/32x4⅛	Dec. 5	785-786
Oldsmobile	110-3600	8—3¼x3⅞	Dec. 12	825-826
Oldsmobile	95-3400	6—3 7/16x4⅛	Dec. 19	863-864
Studebaker	115-3600	8—3 1/16x4¼	Dec. 26	887-888
Ford	60-4200	8—2.6x3.2	Jan. 2	25-26
American-La France	240-2800	12—4x5	Jan. 9	55-56
G.M.C.	81-3000	6—3 5/16x4⅝	Jan. 16	93-94
Willys	48-3200	4—3⅛x4⅜	Jan. 23	121-122
Alvis	102-3600	6—3¼x4 1/16	Jan. 30	157-158
Menasco	200-2250*	6—4½x5⅛	Feb. 6	197-198
Vauxhall	80-3600	6—3.23x4.0	Feb. 13	233-234
Morris	80-3700	6—3.23x4.33	Feb. 20	265-266
Lycoming	120-2800	8—3¾x4¾	Mar. 6	405-406
Bristol	915-2600*	9—5¾x7½	Mar. 13	433
Graham Supercharger	116-4000	6—3¼x4⅜	Mar. 13	434
Pratt & Whitney	950-2550*	14—5½x5½	Mar. 20	473
Continental	230-2290	7—5⅛x4⅝	Mar. 20	474
International Harvester	111.5-2700	6—4⅛x4½	Mar. 27	505-506
Bugatti	140-4800	8—2.83x3.94	April 3	537-538
Humber	100-3400	6—3.35x4.72	April 10	567-568
Daimler	95-3600	8—2.83x4.13	April 17	599-600
Fiat	13-4000	4—2.05x2.64	April 24	631-632
Renault	110-3400	8—3.346x4.724	May 1	667-668
Jewett	32-4000	4—2.49x3.62	May 8	705-706
Wright	850-2100*	9—6⅛x6⅞	May 15	733-734
Buessing	55 hp.	.....	May 22	771-772
Alfa Romeo	76-4400	6—2.76x3.94	May 29	819-820
Citroen	42-3500	4—3.07x3.94	June 5	849-850
Ricardo	....	6—4¾x5½	June 12	883-884

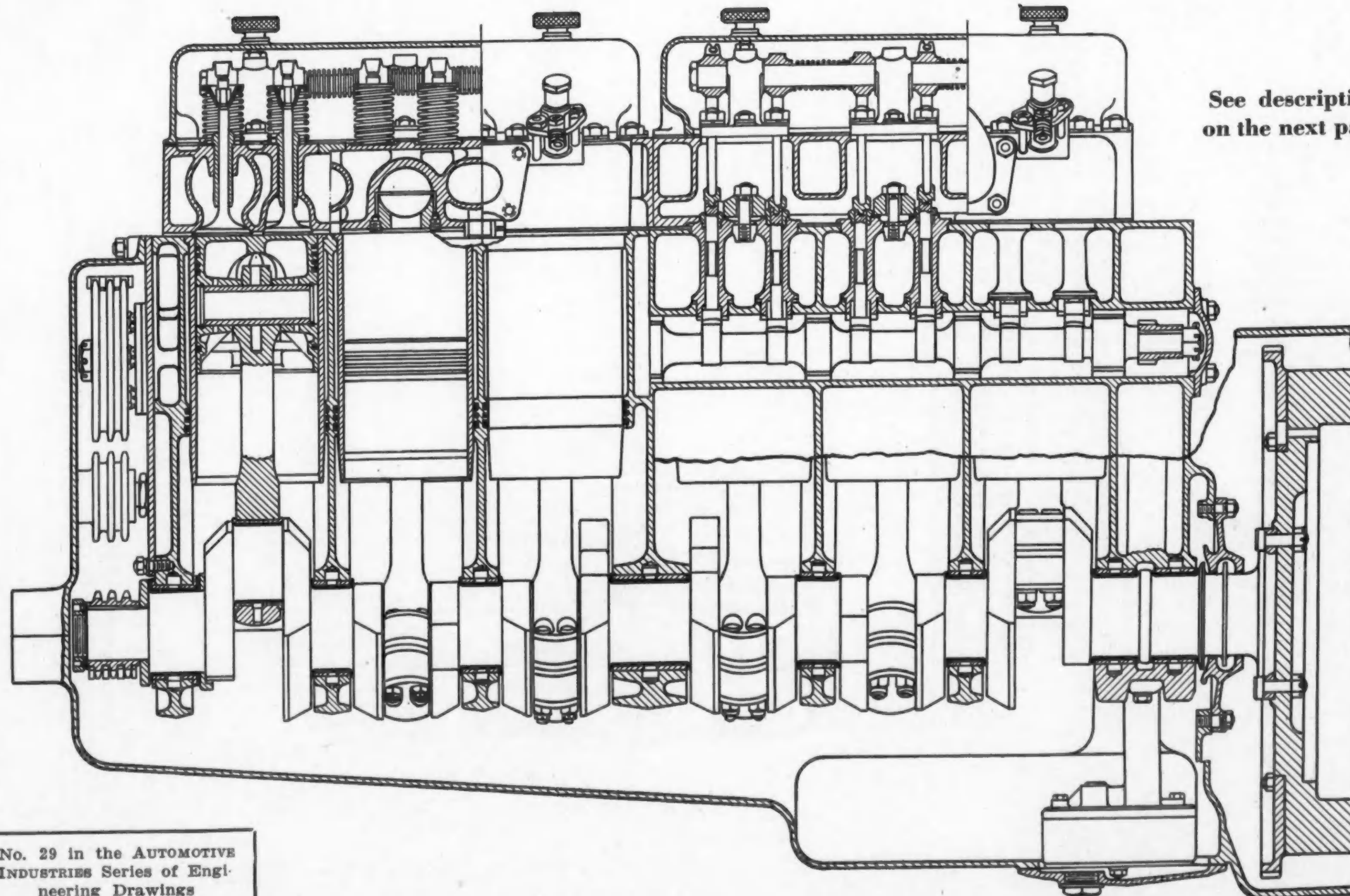
*Aircraft engine; hp. maximum, except "take-off."

Engine Drawings To be Published in Automotive Industries

Engine	B. Hp. at Specified R.P.M.	No. of Cyls., Bore and Stroke (in.)	Date of Publication	Page No.
Wolseley	100-3800	6—3.23x4.33	June 19	
Hirth	80-2320	4—4.01x4.33	June 26	
Hercules	77-2600	6—3.5x4.5	July 3	
Armstrong-Siddeley	....	6—3¼x4½	July 10	
Peugeot	56-4250	4—3.27x3.62	July 17	
M. G.	78.5-4200	6—2¾x4	July 24	
Hotchkiss	85-3800	6—3.15x3.94	July 31	
Thornycroft	85-2200	4—4⅛x6	Aug. 7	
Talbot	90-3800	6—3.07x4.11	Aug. 14	
Rover	60-4200	6—2.65x3.93	Aug. 21	
Lancia	47-4000	4—2.83x3.27	Aug. 28	

Ricardo Turbulence-Chamber-Type Diesel Engine

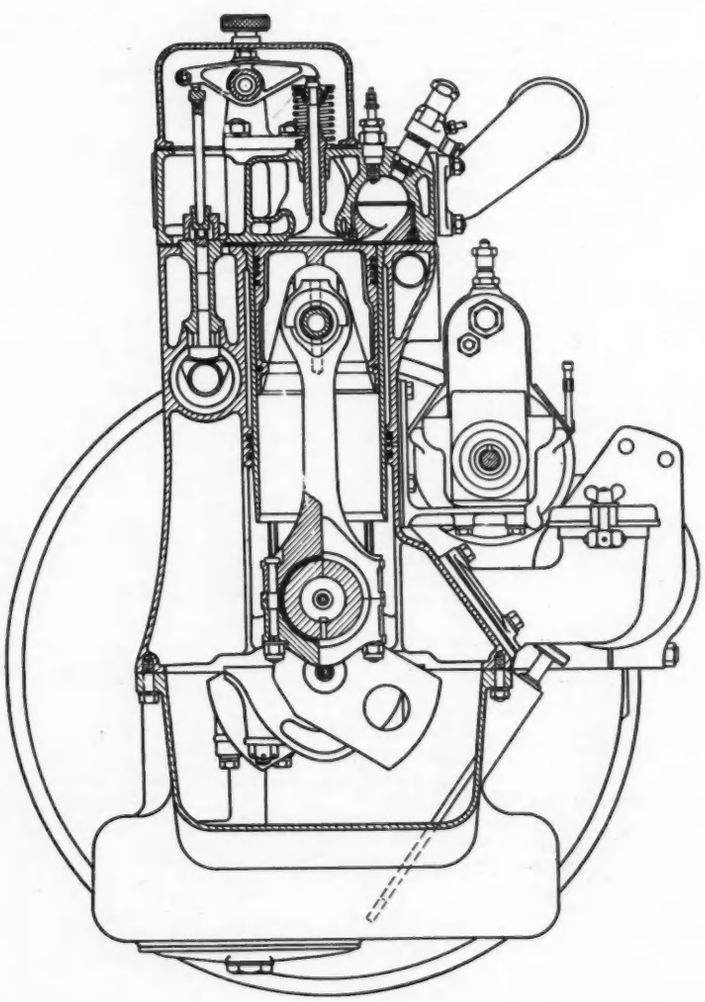
See description on the next page



No. 29 in the AUTOMOTIVE INDUSTRIES Series of Engineering Drawings

Ricardo Turbulence-Chamber-Type Diesel Engine

This drawing shows a design of Diesel engine due to Ricardo & Co., a firm of engineers who develop new designs and license manufacturers under their patents. The engine shown is of the six-cylinder type. It will be seen that all parts, including the engine block, crankshaft and connecting rods, are of very robust design. Valves are located centrally in the head and are operated from a chain-driven camshaft at the side of the cylinders. The turbulence chamber, which is formed in the cylinder head over to one side, is of spherical shape, and the fuel is injected across it, the jet being aimed at a point just behind the outlet of the passage. Ignition starts near the tip of the fuel spray, and combustion is maintained by the continuous flow of air past it. As the temperature rises within the chamber, the flame creeps back along the spray, until toward the latter part of the process, burning takes place close to the nozzle.



The turbulence chamber is provided with an insert at the bottom which absorbs some of the heat generated during combustion and returns it to the air during the following compression. In this way the ignition lag is reduced and the operation of the engine is made smoother. By varying the degree of heat insulation of the insert, the delay period can be controlled. Since the heat capacity of this member is small, and its temperature is controlled by the amount of fuel burned, it will rise and fall with the speed and load, and thus provide an automatic timing control, which is claimed to enable the engine to operate at all speeds and all loads with fixed injection timing and at constant maximum pressure.

N.A.C.A. Study of—

Factors that Affect Friction in Diesel Engine Operation

THE power output of internal combustion engines is limited by friction losses, which latter, expressed in horsepower, increase more rapidly than the speed of revolution, whereas the indicated power increases less rapidly than the speed. Restriction of output is, of course, a particularly serious matter in the case of aircraft engines. Considerable work has been done in the past on the problem of determining the losses due to the various sources. These studies, however, had been confined to spark-ignition engines. The N.A.C.A. has

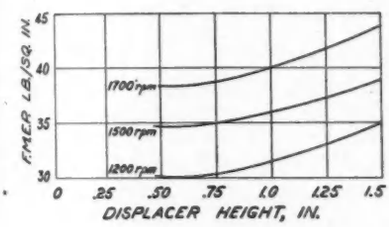


Fig. 1 — Effect of displacer height on friction m.e.p. Compression ratio, 13 to 15.7; oil "out" temperature, 165 deg. F.; water "out" temperature, 170 deg. F.

now made a similar study on Diesel engines of the single-cylinder type, and the results are collated in N.A.C.A. Technical Note No. 577—"Friction of Compression-Ignition Engines," by Charles S. Moore and John H. Collins, Jr.

Two single-cylinder 5 by 7-in. test engines were used, both water-cooled four-stroke-cycle units. The engine bases and cylinders, of regular universal test-engine design, were so constructed that the compression ratio could be varied at will by raising or lowering the cylinder and head. Two cylinder heads were used, an N.A.C.A. No. 7 head, used both with and without a prechamber, and an N.A.C.A. No. 4 head, used with both a displacer and a conventional piston. Each had its valves timed for optimum four-stroke cycle operation, and no change in valve timing was made when changing from one type of combustion chamber to the other. It may be explained that the term "air flow," which will be used a good deal in the following, refers to the flow of air into and out of the separated part of the combustion chamber.

In all air-flow tests the procedure was the same. The combustion chamber was assembled to give the variable to be studied and the engine was motored by the dynamometer at the predetermined test speed. When all conditions had become stabilized, the dynamometer scale was read, first after externally applying an additional load, and, second, after decreasing the load. In each case the scale arm was allowed to come to rest before reading. Readings obtained in this manner varied by only 0.3 lb. (0.43 lb. per sq. in. m.e.p.), and the average of the two readings was recorded.

An increase in the friction m.e.p. due to air flow was observed as an increase in the total friction of the engine. The breakdown tests showed that the pumping loss at 1500 r.p.m. was about 33 per cent of the total friction; as all the increase in friction m.e.p. should be charged to the pumping loss, an increase of 10 per cent in the total friction m.e.p. would be an increase of 30 per cent in the pumping loss.

As the clearance volume of the chamber was increased from 0 to 70 per cent of the total, the friction b.m.e.p. increased from 33 to 38 lb. per sq. in. at 1200 r.p.m.; from 36 to 41 lb. per sq. in. at 1500 r.p.m., and from 40 to 46 lb. per sq. in. at 1800 r.p.m.

As the proportion of the air charge forced into the prechamber was increased, the total friction m.e.p. was increased even though the speed of air movement was kept constant. The increase in friction m.e.p. was proportional to the mass of air moved. These data were obtained from the motoring tests of the prechamber, in which the maximum speed of the air flow was held constant by properly proportioning the area of the connecting passage to the volume of the prechamber.

In the friction tests of the displacer chamber the friction m.e.p. increased at an increasing rate as the displacer height was increased, showing the effect of the combination of the two variables, volume and speed (Fig. 1). The effect of forced air-flow speed on the friction m.e.p. is shown in Fig. 2. In general, the friction m.e.p. increases with increase in air-flow speed as a straight-line function. In either type of chamber the cost of generating the required air flow is approximately 5 lb. per sq. in. in friction m.e.p.

As the inlet pressure was increased, a small increase in friction due to the greater density of the air forced through the connecting passage was noted for the prechamber. With the integral chamber the friction m.e.p. is practically constant over the range of speed covered in the tests. Later tests,

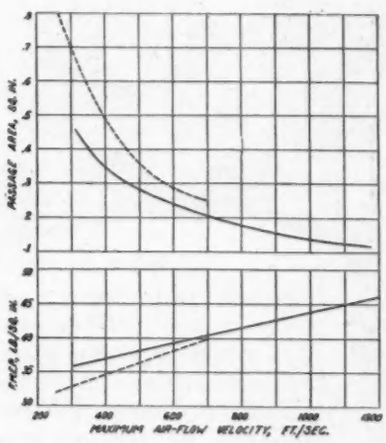


Fig. 2 — Effect of maximum air-flow speed on friction m.e.p.

Full lines: Prechamber head, 50 per cent clearance in prechamber, 13.5 compression ratio; oil "out" temperature, 140 deg. F.; water "out" temperature, 170 deg. F. 1500 r.p.m. Dotted lines: Displacer combustion chamber, 15.3 compression ratio, 165 deg. F. oil temperature, 170 deg. F. water temperature, 1500 r.p.m.

using a displacer piston at 15.3 compression ratio and at 2,000 r.p.m. have shown that the friction decreases from

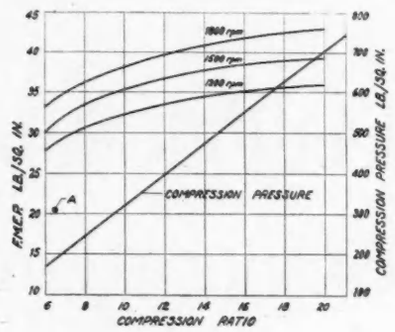


Fig. 3—Effect of compression ratio on friction m.e.p. and compression pressure
Prechamber cylinder head with integral chamber, oil and water "out" temperatures, 180 deg. F.

44 to 38 lb. per sq. in. m.e.p. when the boost pressure is raised from 0 to 20 in. of mercury column. Enlarging the throat area was found to decrease the friction m.e.p. at all speeds and boost pressures tested. In every case the supercharger was driven independently, and the friction m.e.p. was measured for the engine alone.

As the temperature of the cooling water leaving the engine jacket increased from 124 to 195 deg. F and the temperature of the lubricating oil rose correspondingly, the friction m.e.p. decreased uniformly from 38.5 to 34 lb. per sq. in.

The apparently inherent and unavoidable loss due to compression-ratio increase (Fig. 3) is caused by pressure leakage and heat loss, which decrease the energy returned to the flywheel on the expansion stroke. The curves indicate that a compression-ignition engine operating at a compression ratio of 15 would have a friction m.e.p. greater by approximately 6 lb. per sq. in. than a carburetor engine at a compression ratio of 7.

Friction characteristics of two nine-cylinder compression-ignition aircraft engines are shown in Fig. 4. The engines are both air-cooled radial of the single poppet-valve type. Because of the low friction values and slight slope of the curves, the lower curve was completely rechecked. The low friction values may be attributed in part to the use of the single large poppet valve, instead of two smaller valves, and to the complete absence of induction piping and blower.

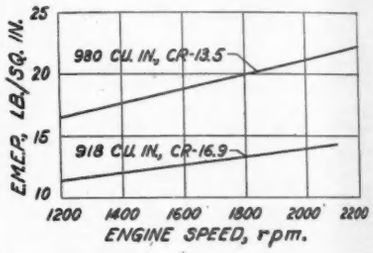


Fig. 4—Effect of speed on friction m.e.p. of radial air-cooled four-stroke-cycle single valve Diesel engines
Upper curve 980 cu. in. engine with 13.5 compression ratio
Lower curve: 918 cu. in. engine with 16.9 compression ratio
Lubricating oil and water "out" temperatures, 150 deg. F.

Sparkless Tools for Safety

In doing mechanical work in localities where there is considerable fire hazard by reason of the possible presence of inflammable gases, tools which are likely to produce sparks must not be used. In such localities it has come to be the practice to use non-sparking tools made either of aluminum bronze or beryllium-copper. With aluminum bronze it is possible to obtain Brinell hardnesses ranging between 100 and 350 without heat treatment. The hardest

grades can be used for cutting tools, in spite of the fact that they are somewhat brittle, and the softer grades are used for operations where considerable shock must be withstood by the cutting material. Tools of aluminum bronze are said to cost substantially twice as much as steel tools but less than half as much as tools made of beryllium copper.

Alemite's Effective Layout for Die Casting

(Continued from page 875)

erable saving in labor. Plating follows quite conventional practice except for the bright nickel which is done according to a patented commercial process in which a brightener, pit-preventing agent and organic carrier are added separately and their quantities closely controlled.

Castings enter the plating department on a conveyor, in the case of large parts, and in tote boxes in the case of the smaller castings and after plating are delivered by similar means to the inspection and packing departments. In a few cases, castings which require enamel over a part of the plate are routed through a separate department where this enamel is applied and baked on.

Although the foregoing applies largely to zinc-alloy die castings, and entirely to them, so far as plating is concerned, production, cleaning and machining aluminum alloys follow a similar routine.

Practically all the dies used for casting and the tools used for cleaning and machining operations are made and maintained in a well equipped tool room in a separate wing of the plant.. These tools are designed in the engineering department which also maintains close contact with customers and advises them, so far as feasible ,on points of design which have a bearing on the cost of tools and on the adaptation of the design to production on an efficient basis. It will thus be seen that the plant is well equipped to turn out complete and finished jobs, furnishing die castings which are ready to assemble into finished products, be they automotive vehicles, units thereof or manufactured items for other purposes.

Production Lines

(Continued from page 880)

tions, producing four shafts per mold. In the original experimental work leading to standard foundry practice, it is necessary to experiment with the alignment of the core sections to discover the arrangement in which the natural distortion of the casting is compensated to a degree that will produce a straight and accurate shaft ready for machining without straightening.

Cast Grilles

To be or not to be—that has been the question on the die-cast radiator grilles. Definitely the answer for 1938 is—TO BE, with a possibility of even greater extension of use. However, there is a likelihood of changing style to approach a more simple construction with less weight. It seems that the Olds Six has struck a very popular chord along this line.

More Comfort

Although rather far in the future, it is of interest to note that important organizations are doing some practical thinking about the air-conditioning of passenger cars. A pipe dream but a few years ago, the idea seems much closer to a practical realization. —J. G.

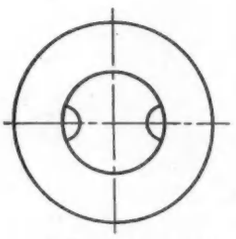
Injection Pumps

(Continued from page 882)

crease in the delivery with an increase in speed. Another factor tending in the same direction, and of even greater importance, is the valves. The delivery valve begins to close the moment the pressure is relieved, but it takes some time to close, this time being independent of pump speed. While it is closing, the fuel in the line expands and flows back toward the pump, thereby diminishing the quantity of the next injection. The amount of fuel returning through the delivery valve is dependent on the line pressure and therefore on the speed.

By acting on these various disturbing elements they can be made to neutralize each other, thus obtaining a straight-line characteristic. Sometimes a drooping characteristic is wanted, that is, a pump delivering less fuel per cycle at low speeds. This effect can be obtained by making changes in the delivery valve, its lift, and its closing time; as a rule the pump must be adjusted for each particular design of engine, as the action of the valve is dependent on the quantity of fuel in the line.

The way the problem has been solved by Précision Mécanique is illustrated in Fig. 4. Between the plunger and the delivery valve is located a piston *A* provided with two grooves for the fuels to pass through, the height of the piston being such as to give a predetermined clearance between it and the cylinder. At the moment of delivery, the piston rises; as soon as the pressure is relieved the spring returns the piston suddenly, thereby creating a vacuum between the valve and the piston head. During the following suction stroke, owing to the clearance, the vacuum will fill up in part, and the amount of fuel which enters may be



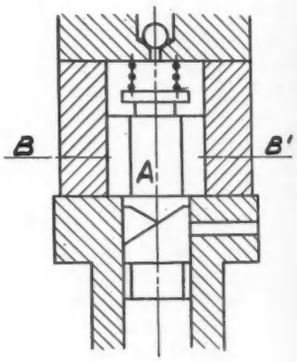


Fig. 4—Diagram of delivery control device

denoted by kt, where t is the time of the suction stroke. If the quantity of fuel injected without this device is denoted by Q the amount injected with the piston in place is

$$Q - (V - kt) = Q + kt - V.$$

It will be seen that if t increases, that is, if the speed drops, the fuel quantity injected decreases, and it has been found possible to predetermine quite accurately the characteristic of a pump fitted with this device.

Précision Mécanique has concerned itself also with the problem of gasoline injection. This problem may be attacked in two ways; as the fuel may be injected either into the manifold or directly into the combustion cham-

ber. Fuel can be injected into the inlet manifold at quite low pressure, and a pump for this purpose presents

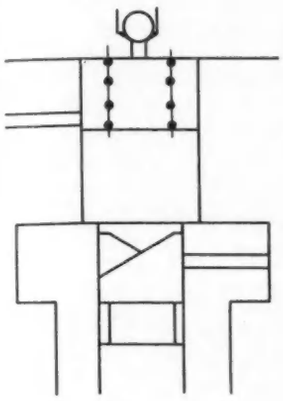


Fig. 5—Diagram of gasoline-injection pump

no great mechanical difficulty. If fuel is injected directly into the combustion chamber, it must be finely atomized and therefore sprayed under very much higher pressure. Not only must the pump operate under high pressure but is must not seize.

In the P.M. pump, illustrated in Fig. 5, instead of fuel being delivered directly into the high-pressure line, it is delivered into a space below a relay piston which is forced down by a spring. In operation this piston has a reciprocating motion, and the amplitude of this motion varies with the control position of the pump plunger. When the pump no longer delivers any fuel it may be supplied with oil. When the relay piston is at the bottom of its stroke it uncovers a fuel-admission port. During the following up stroke the fuel trapped above the relay piston is moved toward the injection valve, and as the pressure below the piston is greater than that above it, a very slight leakage of oil assures lubrication of this relay piston, which, according to M. Outin, never seizes. Gasoline has been injected under pressures of 300 atmospheres with this device, without trouble from sticking.

April Indices for Automotive Parts Rise

The April grand index of the Motor and Equipment Manufacturers Association rose 21 points to 178 per cent of the January, 1925 base, against 157 per cent for March and against 162 per cent in April, 1936. Original equipment shipments to vehicle manufacturers stood at 199 in April against 174 in March and against 181 a year ago. Service parts shipments to wholesalers were 155 in the index against 134 in March and against 125 in April of last year. Accessories shipments to wholesalers showed a decline to 92 from 96 in March, against 130 in April, 1936. Service equipment shipments to wholesalers rose to 160 from 139 in March, against 104 a year ago.

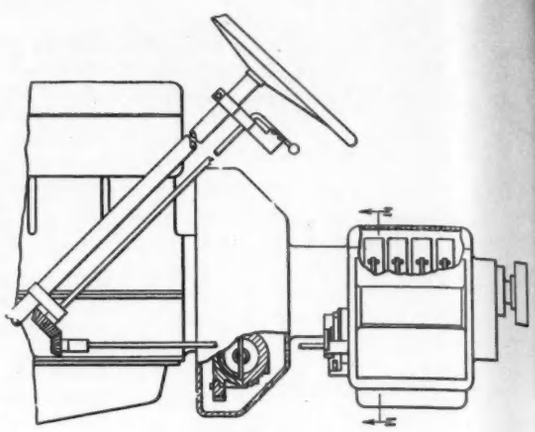
The National Standard Parts Association reported its April, 1937 index of automotive sales at 156 against the average monthly sales in 1934 taken as 100. This compared with 147 in March and with 147 in April, 1936. Replacement parts shipped to wholesalers were indexed at 134 against 129 in March and 135 a year ago. Service equipment and tools to wholesalers were 166 against 142 in March and 153 a year ago. Original equipment to vehicle manufacturers stood at 310 against 258 in March and against 190 in April of last year. Export shipments were 135 against 140 in March and against 108 last year.

Edmund Connelly

Edmund Connelly, former General Motors Corp. paymaster in Detroit and in Flint, died at Columbiaville, Mich., at 45. He retired from active work in 1932 due to ill health.

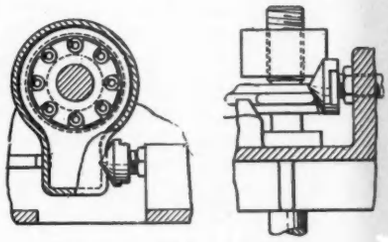
Braking Device

OF late years, hydraulic couplings in conjunction with planetary transmission gears have come into wide use on passenger cars abroad, and some work has been done on combinations of this sort also in this country. The planetary transmission requires friction brakes by means of which the different speeds are engaged. A patent assigned to Chrysler Corporation* aims to hold the clearance of a toggle brake within narrow limits, and thus maintain the proper braking action with a small travel of the mechanism.



Diagrammatic view of the braking device patented by Herbert F. Patterson

The band of the brake is contracted by forcing a flange at one end upward by means of a threaded stud screwed into the flange. At its lower end the stud has a ball portion which is received in the socket of an actuating finger. This patent covers only the band-clearance take-up device, which is associated with the stud and is illustrated by the drawing reproduced herewith. When there is more than the normal clearance between band and drum, the threaded stud will have a greater travel during application of the brake. Then an arm on an adjuster housing moves up on a cam surface and



Patterson braking device

slightly rotates the housing around its axis. Within the housing there is a friction clutch comprising friction discs held together by a number of coil springs. When the housing is rotated during the upward movement, it slides on the ends of the springs, as the friction on the thread of the adjusting stud is then too great to permit of the stud being rotated. When the selector mechanism is released the flange on the end of the brake band moves downward and the back side of the lever arm contacts with an inclined surface on a stationary part, which shifts the lever back to its original position. During this return movement there is no perceptible pressure on the threads of the adjusting stud and the coil springs then produce enough holding power in the clutch to carry the housing along and to slightly unscrew the stud from the flange on the brake band, thus effecting the adjustment.

* Patent No. 2,052,054. Braking Device. Herbert F. Patterson, Detroit, Mich.